The
Electrical Review

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Bus-zone Protection

ACCEPTED practice in engineering details connected with electricity supply is usually a resultant of forces. One obvious advantage may be obtainable only at the cost of ignoring another. A classic example is to be found in attempts to secure high power factor; 100 per cent. is good, but the expense of securing it more often than not destroys its economic value, so that 90 per cent. or so gives perhaps the best compromise.

The desirability of protecting from excess current all parts of an electrical system will not be questioned. Yet, although this is enjoined by the Home Office Regulations, more than two-thirds of the main switchgear in a power station, including circuit-breakers, isolators, bus bars, reactors and spout insulators, is generally unprotected. What are the adverse influences that prevent compliance with the letter of the law? Broadly, the possibility of extensive damage to the control centre has had to be set against a greater chance of unnecessary tripping of circuit-breakers.

Several instances have occurred within the last year or two which support the view that the balance of forces is becoming more favourable to the adoption of complete "overall" protection. While too great a weight should not be attached to abnormal individual breakdowns, since one might expect the laws of probability to work against their recurrence, there is always the chance that they may be the preliminary signs of the coming into being of a new set of circumstances that are likely to demand a modification in existing methods, and thought in differentiating between the two types of breakdown is called for.

The problem of bus-zone protection has been forced upon the electrical industry by its own growth, that is, by the greater power liberated under short-circuit. The small alternator of earlier times was able to feed only a limited current into an earth fault. To-day an earth fault can involve all phases within a few moments, and a circuit-breaker must open practically instantaneously to prevent the trouble spreading.

As an example of the difficulties of keeping pace with the trend of developments, there is the current transformer installed for operating the circuit-breaker under fault conditions. Its rating in amperes formerly bore little relation to the rupturing capacity of the switchgear, but this anomaly is, we believe, corrected in a British Standard Specification, shortly to be issued, which gives a time-current rating to the current transformer and brings it into line with the performance of its associated circuit-breaker.

However, the will to progress that has evolved the large modern alternator has also created discriminative protection to meet most conditions, and Mr. T. W. Ross discusses in this issue methods that have been successfully applied to the bus-zone. The cost of dealing with existing switchgear in this way would, no doubt, often be higher than the risks warranted; and the number of stations with completé bus-zone protection could, we believe, be numbered on the fingers of one hand. Nevertheless, the estimation of the balance of forces—continuity of supply, freedom from fire risk, and expenditure—(especially with regard to new construction) is to be commended to the consideration of all engineers who are concerned in power-station design.

Golden Power

MR. ARTHUR E. HADLEY was once again in a very enviable position at this year's meeting of the Victoria Falls & Transvaal Power Co., of which he is chairman and managing director. Power supply prosperity, due to the continued gold-mining activity, was greater than ever; indeed, it was quite embarrassing. Not only has the past year yielded a net profit of

£543,076, permitting the payment of substantial dividends and reserve and renewals allocations, but the demand for electricity placed a great strain on the company's production facilities. Happily, the Klip power-station came into commission during the year and gave some relief; a fourth set is now being installed. Everything was done to get quick delivery of new plant, while consumers so arranged their loads as to ease matters, and the Johannesburg municipality assisted at such times as its plant permitted. Mr. Hadley said that the Klip generating-station would be the natural place for putting down further generating plant. He added that during the past five years the company had expended over two million pounds on plant and apparatus, and this sum will be substantially increased by plant now on order and work in hand. The reductions in charges to consumers which took place in 1934 and 1935 have been considerable; their effect during 1935 was to give consumers a saving of £100,000. Shareholders were fittingly reminded of the fact that future additions to business will not produce a proportionate increase of profits, owing to the altered charges. The speaker, in reviewing the general situation, said that the activity, and possibly the life, of the gold-mining industry had been doubled by recent events.

Electro-Therapy

THE virtues of electricity as a curative agent were extolled by Dr. W. J. Turrell, of Oxford, at the B.M.A. Conference last week. He referred to it as a powerful remedy which struck directly at the base of the trouble, and in many cases produced a cure in a few days of conditions which had resisted for weeks or months the indirect action of drugs, liniments and ointments. At the same time he accused the medical profession of neglect and indifference in the proper use of electricity. His remedy was to put the subject of electro-therapy definitely in the medical curriculum and set up adequate and efficient equipment in the larger clinics and hospitals. We have a feeling that electricity has not yet recovered from the electric-belt and other charlatanism which dogged its early days. It was generally considered that the fraudulent practices associated with the sale of electro-medical appliances gave a long set-back to legitimate electro-medical work. But much is being done at our leading hospitals in the way of electrical treatment, and perhaps Dr. Turrell's condemnation was a little too sweeping. However, if it serves the purpose of causing more attention to be paid to the subject, it will have done good. The provision of complete electrical equipments for our hospitals is an object which should make a strong appeal to the hearts of generously minded wealthy men who wish to devote part of their substance to the scientific relief of suffering and the cure of disease.

Their Choice

LOCAL authorities owning electricity undertakings may deprecate gas interests being given power to provide installations in Council houses, but they have no reason to fear it. Provided the tenants are shown how simple and clean electrical apparatus is to operate and details of costs are placed before them, we have no doubt what, in the majority of cases, their choice will be. It is more difficult to arrange demonstrations where the houses are not owned by the authority, but if this can be done the results are likely to be equally successful. In support of this we may quote from the annual report of Mr. Robert Lee, borough electrical engineer of St. Pancras. Recently two large blocks of working-class flats were erected in the area by separate housing authorities, and in each case the Department was given facilities to demonstrate the advantages of electricity for domestic purposes. In one block sixty out of a total of sixty-two tenants elected to utilise an all-electric service, and in the other case seventy-five out of eighty-three tenants chose electricity. Were it not for the enterprise of the Department nearly the whole of this useful load might easily have been lost.

Electrical Accidents

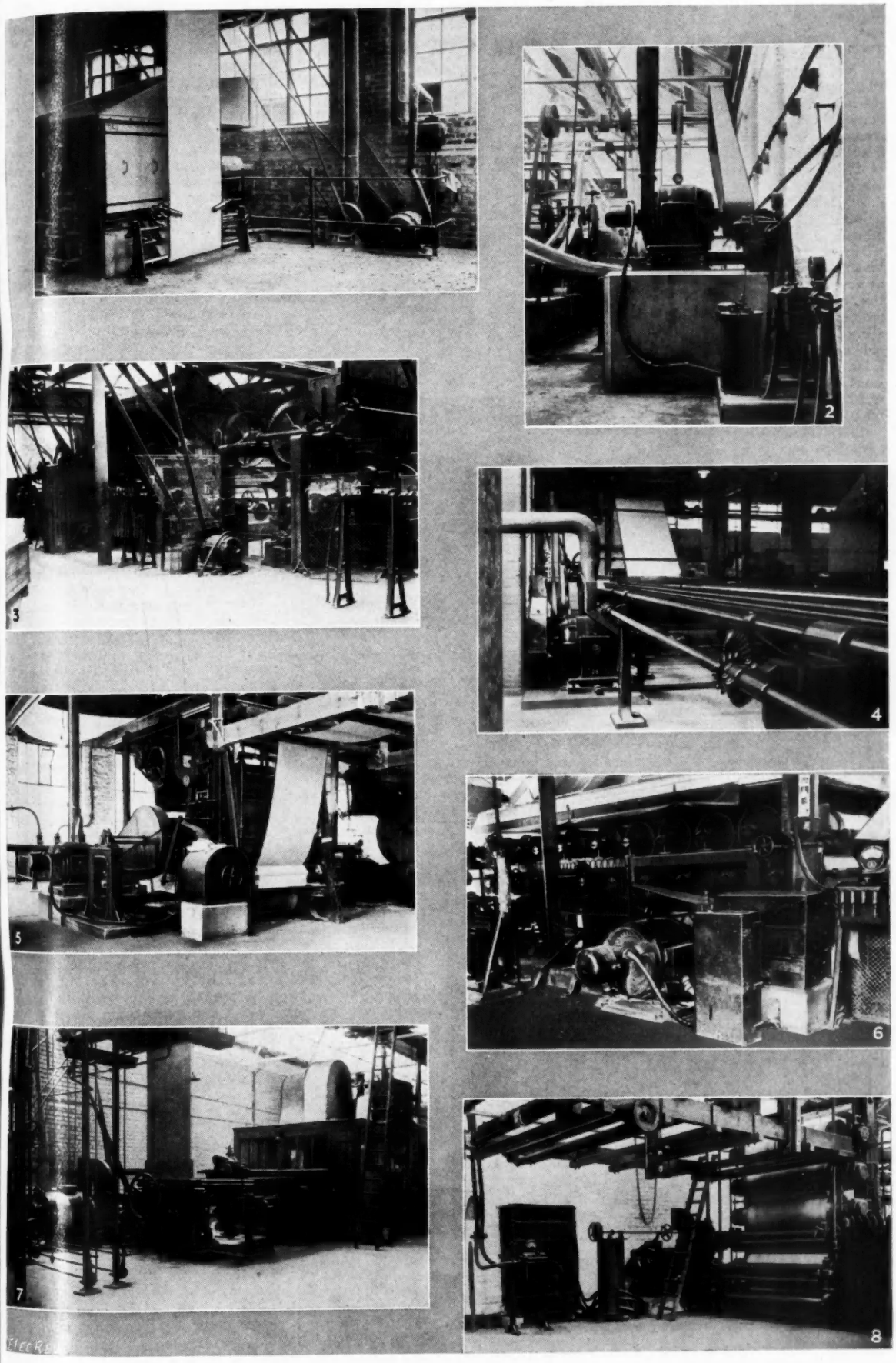
IN reviewing the electrical accidents which were reportable during 1935 under the Factory and Workshops Acts a change has been introduced in the comparison with previous years' figures. The electricity sold during the year under review for power only has been substituted for the total energy sold for all purposes, certainly a better criterion. Our summary on page 142 shows that there was an increase in the total number of accidents on factory premises (447 against 380), but that the proportion of fatalities was less (23 against 31). It is not thought, however, that any special significance is attached to the latter figures, since there is a good deal of evidence to show that they are largely influenced by whether artificial respiration is, or is not, properly applied. When considering "dangerous occurrences," it should be remembered that the Notification Order was amended during the year under review, so that in future more occurrences of this class are likely to be reportable. It is worthy of note, on the one hand, that during 1935 no fatalities occurred on d.c. systems and that the majority were caused by a.c. below 250 V. On the other hand, the report suggests that statistics might show that more fires ascribed to "causes unknown" occur in d.c. areas. In the case of one d.c. town it is learned, for what it is worth, that the fires attributed to electricity represented 9 per cent. of the total, whereas in another comparable town supplied entirely with a.c. the figure was 3.5 per cent. In the d.c. town nine fires occurred during the year due to the electrical ignition of gas leaking from composition pipes. One certain fact that emerges from all this is that no form of insulation can reasonably be expected to last indefinitely.

Birmingham Road Lighting

BY reason of its industrial character and the control of the roads over a wide area by one authority, there is in Birmingham both the need and the opportunity for good road lighting. To secure this a scheme which involves nearly 200 miles of thoroughfare and an expenditure of £76,612 came before the City Council this week. In putting it forward, the Public Works and Town Planning Committee noted that the improvement of main road lighting had accentuated the poor standard of illumination of others, causing a definite danger to drivers of vehicles proceeding from the better to the worse lighted thoroughfares (a point emphasised by the Departmental Committee on Street Lighting in its interim report published towards the end of last year). It is, therefore, proposed to install electric-discharge lighting throughout the arterial roads leading from the city centre, on the outer and inner circles, and on bus routes and the more important secondary roads, while the lighting of the first 100 yards of all junction roads is to be increased. It is to be hoped that the example set by Birmingham will encourage other authorities to proceed with schemes for securing uniform road lighting in their areas, even though the final report of the Departmental Committee has yet to come.

"Safe" Voltage

ALTHOUGH discussions as to what voltage is likely to be harmless have been common enough since the earliest days of electricity, there exists no body of data from which reliable conclusions can be drawn to meet any set of conditions. The great diversity in the effect on different people of touching live apparatus—the effect varying widely with the same person in altered circumstances—has no doubt given rise to the view that no useful deductions are to be drawn from experiments. Especial importance, however, has been given to the subject by references to maximum voltages in official regulations. The tests carried out in Zurich, which are discussed by Mr. T. C. Gilbert in this issue, indicate lines along which useful investigations might be made in this country.



Messrs. J. J. Hadfield's Dye and Bleach Works at Birch Vale. **(See next page)**

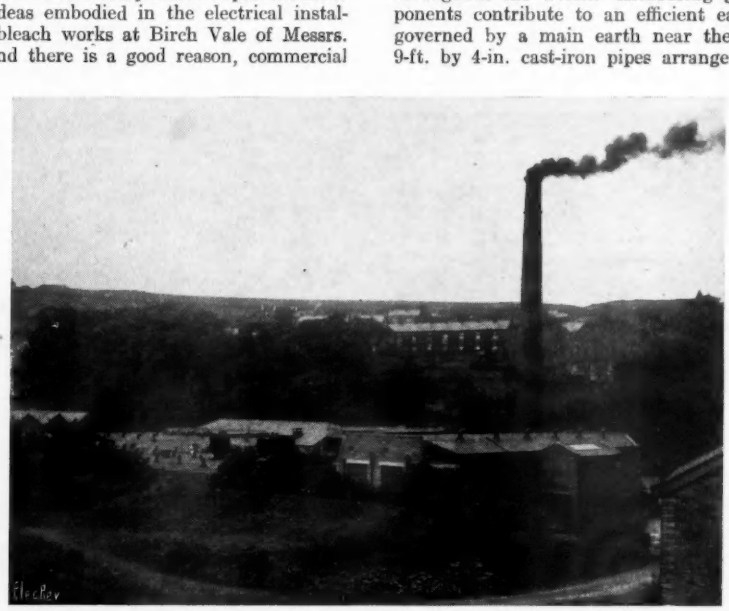
1. Singeing machine with 10-h.p. drive. 2. 110-h.p. group croft drive. 3. Some of the beetles and drives. 4. 40-h.p. drive for stenter. 5. Six-bowl calender driven by 40-h.p. motor. 6. Combined filler and drying machine. 7. Hot-air stenter and its drives. 8. A shriner (40-h.p. motor)

Dye and Bleach Works Equipment

Varied electrical drives and controls

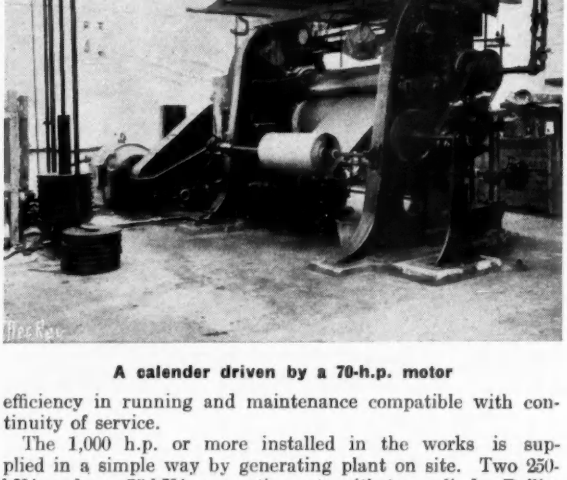
A 110-h.p. group drive and a single machine with three individual drives (5 h.p., 25 h.p., and 35 h.p.); a ¼-h.p. motor and a 110-h.p. motor; slip-ring, commutator and squirrel-cage motors; electrical and mechanical speed variation; electrical speed regulation "internally" by commutator motors and "externally" by resistance controllers in conjunction with slip-ring motors; and belt and chain power transmission. These comparisons represent some of the widely varied ideas embodied in the electrical installation at the dye and bleach works at Birch Vale of Messrs. J. J. Hadfield, Ltd., and there is a good reason, commercial or technical, for every scheme adopted.

The works may reasonably be described as new in that during the erection of the present new building about the now rased old one and the demolition of the latter (a lengthy period during which production was maintained as under normal conditions) full advantage was taken of the opportunity to reorganise the equipment and installation throughout. Electrically, perhaps, the most interesting feature of the remodelled installation is the freer adoption of group driving after a period during which there was a tendency to give greater attention to the modern call for individual driving. And that period followed the change-over from steam to electric driving fifteen years ago, before which the whole of the works was operated by three large group drives.



An exterior view of Messrs. J. J. Hadfield's works

It is obvious, however, that now Messrs. Hadfield believe there is a place for both the individual and the group drive. Mr. J. Baxter, the works electrical engineer, explained that whereas in the croft, for instance, where there is always much water about, the best system is one large motor only mounted well above the floor level, in the kier room, where the atmospheric conditions are very much worse and consequently where most of the electrical troubles are found, group driving is prohibited because of the widely varying load conditions. A 60-h.p. motor which would probably serve all the nine kiers would at times have to drive one kier only for considerable periods. In a word, both driving systems have been considered for all the driving schemes collectively and separately with a view to obtaining the greatest economy and efficiency in running and maintenance compatible with continuity of service.



A calender driven by a 70-h.p. motor

The 1,000 h.p. or more installed in the works is supplied in a simple way by generating plant on site. Two 250-kVA and one 75-kVA generating sets with two-cylinder Belliss & Morcom and similar steam engines and Mather & Platt generators serve the works at 410 V, three-phase, 50 cycles *via* a M. & P. open-type slate machine and feeder switchboard complete with a synchronising panel common to the two large sets and two lighting panels for 240-V phase-to-neutral lighting supplies, in addition to the machine and power panels. Steel armoured cables of up to 160-A capacity connect the switchboard to the ironclad distribution boards and motors and starters at various points throughout the works. Armouring glands on all these components contribute to an efficient earthing system which is governed by a main earth near the power-house with four 9-ft. by 4-in. cast-iron pipes arranged vertically and coupled together and standing in coke breeze which is kept wet by drainage from an adjacent lodge.

Lengths of cloth from the mills are sewn together by ¼-h.p. Singer machines to form one continuous length which is first passed over the gas jets of a singeing machine to remove loose fibre. In addition to propelling the cloth for this process a 10-h.p. s.c. motor with a star-delta starter also drives a water mangle (through which the cloth is subsequently passed) and fans above the singeing jets to remove the fumes. We were told that the half-inch of fluff we saw on this motor was half a day's accumulation and that the greatest risk of trouble from the fluff was its tendency to get drawn into the oil bearings.

From this machinery group cloth is drawn continuously to the croft, where we saw the 110-h.p. group drive already referred to. This s.r. motor drives a line of overhead shafting through a 14-in. belt and is governed by an oil circuit-breaker and a drum-type starter. The machinery in the group includes liming and washing machines, scutching machines and mangles and also winches which draw the cloth through roof-suspended guiding eyes from the other department. Bleaching pits in the croft are served by 15-h.p. s.c. motors coupled to M. & P. centrifugal pumps.

The cloth is conveyed into the kiers previously referred to in which the boiling takes place. These steam-heated vertical cylindrical kiers each hold up to about ten tons of cloth. At night they are sealed up and the liquor is circulated continuously through the cloth by nine-h.p. motor-driven centrifugal pumps (one to each kier) situated externally but near the bottoms of the kiers. A pressure is built up in the kiers at night and the steam and water contents are blown off from the bottoms of the kiers in the morning. Considering the nearby location of the motors it is obvious that they must have a pretty hard life in view of the atmospheric conditions associated with the all-night heating of the kiers and the blowing-off process in the morning. Mr. Baxter said that the really big difficulty is, however, to keep grease in the bearings. After being delivered to "white pits" the cloth is opened out from its rope formation on scutching machines and is then mangled to remove the liquor.

Now "pure," the cloth is first treated in drying machines which form the machinery group for a 60-h.p. drive which is very similar in all ways to the 110-h.p. croft drive. Some of the cloth is treated on beetles, fascinating and noisy machines which impart a finish similar to that of calendering but by a very different method. Vertically arranged beech timbers above, say, a 15-ft. roll, are lifted and allowed to fall endwise on to the cloth wound on the roll with a progressive machine end (side) to end movement of the thirty-six timbers. Each beetle has a simple 10-h.p. s.c. motor and chain drive with star-delta control.

In the white finishing room stenters, calenders, back fillers, starching and drying machines and stretchers provide the biggest variety of drives we saw in any one department. In addition to 50-h.p. and 60-h.p. drives for the croft and pure departments and serving back fillers, drying machines and belt stretchers, we saw a 40-h.p., variable-speed, continuous-rating, s.r. motor, with an oil circuit-breaker and an external resist-

ance controller, driving a 90-ft. stenter *via* a Renold chain, a number of calenders with individual s.r. motor and chain drives and variable speed control by means of water starters (25 h.p. for a three-cylinder calender); a 15-h.p. motor with an auto-transformer starter driving three damping machines and drying mangles; and a combined filler and drying machine with chain transmission from a 25-h.p. s.r. motor with an oil circuit-breaker and an Allen West drum controller. This last driving set has been running for fourteen years without any trouble, we were told: not even a contact on the controller has had to be changed. The star-delta practice was departed from in the case of the damping machines and drying mangle because of a rather high starting torque. Our guide said that the water equipments were the most economical starters in the works.

The first process in the dye works is mercerising by which a permanent lustre is added to the fabric. The material is passed through special solutions at one end of the merceriser, while the other end of the machine is a stenter. The propelling unit for all this is a 50-h.p. commutator motor—without any external speed-regulation equipment whatever. It has overall control by an oil circuit-breaker. On the rotor and in the same slots are a primary winding and another winding connected to the commutator. Sections of the stator-housed secondary are connected between groups of brush arms on the front and back rockers.

Varying in magnitude and polarity with the relative positions of the brush rocker sections, a voltage is imposed on the secondary winding, and smooth speed regulation is brought about by gearing together the two components of the rocker to revolve in opposite directions. The motor is fixed at about the middle of the machine and the remote mechanical operating wheel for the commutator rocker is at one end of the machine. The speed and power limits are 350 and 1,050 r.p.m. and 16.7 h.p. and 50 h.p., respectively. The cloth speed on this machine is about 120 ft. per minute. Centrifugal and vacuum pumps on the merceriser are separately driven by a 12-h.p. motor with a star-delta starter.

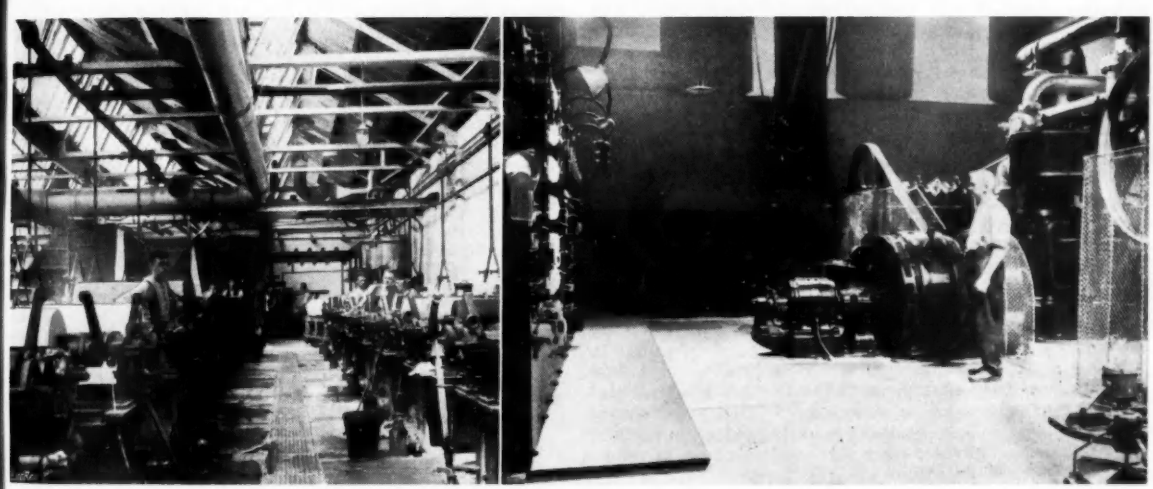
The next operation after mercerising is carried out by a combined washing and drying machine with a 9-h.p. variable-speed commutator motor and Buffoline reducing gear. The speed limits are 675 r.p.m. and 1,350 r.p.m. Mounted in the roof girders is a 37-h.p. motor which drives a line of dye jigs via five 1-in. V-belts and a line shafting. Thirty-seven h.p. on star-delta is "pretty good going," but the reason is the practically no-load starting afforded by the ball bearings of the line shafting. On the dye jigs the cloth is simply passed through the required solutions from and on to rolls. A 15-h.p. s.r. motor with a water starter and a Renold chain is typical of the drives for dye mangles by which the surplus dye solutions are squeezed from the cloth. An individually driven drying machine rather surprised us because of the sharp contrast between the large 30-cylinder vertical machine and 5-h.p. totally enclosed s.c. motor, with a star-delta starter V-belt transmission and Crofts variable-speed gearing.

Perhaps the most interesting drives in the dye section are those for the hot-air stenter. At from 30 yd. to 120 yd. per minute the cloth is first passed through a mangle and then through a 90 ft. chamber, the operation being by a variable-speed commutator motor similar to that employed with the merceriser and with limits of 11.6 h.p. (360 r.p.m.) and 35 h.p. The oil circuit-breaker is interlocked with the brush gear so that the former can be closed only when the latter is in the lowest-speed position. The fan of a super-heater on the chamber roof, serving circulating pipes in the chamber, is driven by a 25-h.p. totally enclosed motor with a star-delta starter. Jigging is a to and fro movement imparted to the cloth on the stenter at the clip points or, say, 4-in. centres at the edges. The somewhat intricate mechanism to afford this is actuated by a 5-h.p. s.r. motor driving through Wallwork reducing gear. A smaller dry stenter is chain driven by a 30-h.p. s.r. motor for which speed variation is afforded by an external resistance controller. Chain and gear is the power transmission combination for a belt stretcher with a 4-h.p. s.c. motor drive.

In this department we also saw several shrines, *i.e.*, calenders with engraved rolls which impart a special silky finish to the material. These are each driven by a 40-h.p. s.r. motor with an external resistance speed regulator; this motor also drives through gearing a pump by which the rolls are subjected to a hydraulic pressure of up to 4,000 lb./sq. in.

What appears to be a reversal of the general order of things in the works (large group drives) is a comparison between a 10-h.p. motor in the roof group driving two damping machines, a fan and an air compressor for the gas feeding of calenders, and a 70-h.p. individual drive for a six-bowl friction calender. This large s.r. motor has variable-speed operation by virtue of an external resistance controller which is mechanically remotely operated from both the back and the front of the machine.

While witnessing some of the final operations in the dye section we saw how a night loading difficulty in relation to group driving had been successfully solved by providing for splitting the group drive at will. A 40-h.p. double-ended motor serves, *via* a line shaft, two beetles, a three-roll calender and three small plating machines. At night only the plating machines are wanted in operation, so that the shaft is split at a clutch box enabling the smaller end only to be driven by a 10-h.p. motor.



Left: A double line of dye jigs with a 37-h.p. drive overhead. Right: One of the large sets and switchboards in the power house

Except where the makers' names have been mentioned practically all the motors employed on this installation were made by Messrs. Mather & Platt, Ltd., who also supplied the water starters for the calenders and star-delta starters and air circuit-breakers employed with the kier motors. All the oil circuit-breakers and most of the star-delta starters in the works proper were produced by Messrs. George Ellison, Ltd., and the external speed-variation controllers were manufactured by Messrs. Vlasto Clarke & Watson, Ltd.

We are indebted to Mr. James Hadfield for his kindness in giving us permission to "go where and see what you like" in his works.

The Swiss Telephone Service

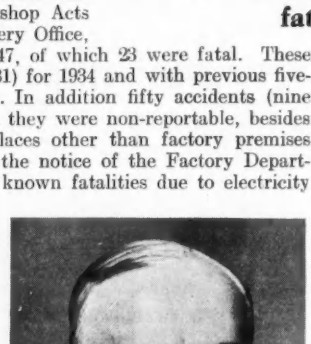
Reuter's Trade Service (Berne) reports that the use of the telephone is spreading in Switzerland. For every 100 inhabitants there are now 8.8 telephones; only in the United States, Canada, Denmark and Sweden is the telephone service more extensive. The telephone administration has installed a considerable number of telephones in places at a high altitude and far away from the beaten track, also on mountain roads, in order to ensure the comfort and safety of tourists. The automatic telephone is becoming more and more general; out of 100 local communications 76 are now automatic. Switzerland, too, plays a very important part as a transit country for international telephone services.

Electrical Accidents in Industry

Increase during 1935, but fewer fatalities

THE electrical accidents reportable during 1935 under the Factory and Workshop Acts (Form 929, H.M. Stationery Office, price 9d. net), numbered 447, of which 23 were fatal. These figures compare with 380 (31) for 1934 and with previous five-year averages of 344 (23.6). In addition fifty accidents (nine fatal), were notified though they were non-reportable, besides 55 electrical fatalities in places other than factory premises which came unofficially to the notice of the Factory Department. Therefore the total known fatalities due to electricity were 87 against 81 during the previous year; 26 of them (20 in 1934) appear to have occurred on premises of a domestic or similar character, four being in bathrooms.

While there was an increase in the total number of accidents on factory premises, the number of fatalities was less (23 against 31), but these figures are not specially significant.



[*Elliott & Fry*

Mr. H. W. Swann, Chief Electrical Inspector of Factories

The increase in the total number of accidents was mostly confined to the skilled category and switchgear was responsible for the largest increase and greatest number of accidents, 139 (7 fatal) against 111 (9) in 1934. Switchgear above 650 V was the cause of a noticeable jump in the number of accidents, which is significant having regard to the fact that, in general, only highly skilled persons, or persons under skilled supervision, are employed in connection with high-voltage switchgear. A number of violent explosions of oil-filled switchgear, causing injuries and one death, focused more than usual attention on certain problems associated with this type of control apparatus.

Connections to Portable Appliances

Portable apparatus accounted for six of the fatalities and thirty-three non-fatal accidents. A notable causation influence is not the absence of earthing conductors, but failure to ensure continued effectiveness. Connecting leads associated with portable apparatus accounted for a large proportion of the cables and flexibles accident group (two fatal and seventy-eight non-fatal). In these cases also the importance of proper maintenance and the use of the best types of flexible cable are emphasised.

Of the nine cases of ignition of inflammable materials the most serious was the explosion of a petrol road car tank at a loading bay in a factory during examination of the interior with a 6-V barrel inspection lamp. The well glass that originally protected the bulb had been removed to accommodate a larger bulb, which broke at the tank opening and ignited an explosive mixture.

With regard to types of system and voltages, most fatalities were caused by a.c. below 250 V; none occurred on d.c. systems.

Concerning "dangerous occurrences," apart from oil switch explosions, the most serious cases were fires involving cables and flexibles. One destructive fire at a large mill was attributed to a short-circuit between old open cleated v.i.r. wires igniting the outer dry cotton covering; the setting of the circuit fuses was much too high. Two other fires in textile mills resulted from a combination of over-fusing and inefficient earthing of slip type conduit, isolated lengths becoming charged and intermittent contact with earthed metal work causing arcing, which ignited cotton fluff.

The number of situations in which the use of electricity is required under conditions that may be inflammable is increasing each year and is presenting difficulties inasmuch as no flameproof enclosures have been certified as safe in some of the atmospheres now being encountered industrially. It is commercially impracticable to test apparatus in each and every inflammable gas, and the Factory Department has therefore considered, in consultation with the Mines Department, the possibility of group certification. Research on the subject has been arranged through the medium of the Electrical Research Association and is being conducted at the Safety in Mines Research Station.

There has been an increase in the number of accidents in connection with electric welding, mainly eye-flash cases. There appears to be reluctance on the part of workers to wear plain glasses (which exclude a large proportion of the harmful ultra-violet rays) even when they are provided. A rapid growth has been noticeable in the application of arc welding methods to structures of all kinds. During the year a case occurred of a welder being rendered unconscious by shock from an electrode at less than 80 V a.c.; artificial respiration was successfully applied for over twenty minutes.

Electrostatic precipitation installations for various industrial purposes are becoming common. Comprehensive safety interlocking schemes are usually desirable, and inspectors have welcomed conferences with firms undertaking this class of work, especially those who are new in this field.

Furnace Operation

The standard of construction of high-frequency furnaces has considerably improved. Working experience has confirmed the assumption regarding the possibility of failure of the insulation of the melt, while the necessity for, and methods of, discharging associated condensers before repair work is carried out has been studied.

Carbon arc furnaces have been constructed for operating at from 200 to 250 V, instead of about 90 V, mainly for shortening the period of melting. One of the results is a considerably increased danger of shock from electrodes and conductors, and it has been very difficult to advise any suitable form of guarding against this risk in its several forms. The most successful protective measure so far adopted is to provide the melters and other workmen with wooden clogs, without iron soles, which form an efficient insulation from earth and can be regularly re-soled every few weeks at small cost. Resistance furnaces for heat treatment are increasing both in size and number, and a number of special points of detail are emphasised in the report.

Travel-limit switching devices and over-winding gear for cranes and similar equipment are receiving considerable attention. Mechanisms examined possess many faults, both of design and maintenance, one prominent feature being the absence of attention to the wear of parts. Representations to manufacturers continue, but the multiplicity of designs renders progress slow.

Developments in the mechanical handling of materials by means of the sequence starting of conveyors and also the plural starting of motors (which latter was originally introduced for ships, and now appears likely to be used also for industrial installations) have raised several points relative to layout and control from the regulations point of view, though the precautions necessary in such systems can only be decided in relation to the circumstances of each particular case.

Arrangements have been made for research to be conducted at the National Physical Laboratory into the conditions under which explosions or fires in dry-cleaning establishments can be caused by static electricity. Inquiries are still in progress regarding the possibilities of harmful X-ray emission arising out of the processes of manufacture and test of cathode-ray tubes.

The ultra-short waves, of the order of 60 to 80 megacycles, to be utilised for television purposes may have harmful physical effects on operatives exposed to such radiation during manufacturing processes. Though evidence of a positive character is not yet available, the attention of firms not cognisant of the problem is drawn to the desirability of taking precautions against this possible risk.

Finally an interesting example of corrosion was revealed by an inspector when using a sensitive instrument for testing at brickworks. He noticed a constant d.c. at a potential of about one volt between structural steelwork and earth, the former being positive, and thus probably being continuously eroded. The current was set up by coal and coke dust with which the lower steelwork had been surrounded in the neighbourhood of some furnaces.

A Kingston Contract

At last Tuesday's meeting of the Kingston-on-Thames Town Council, reports the *Surrey Comet*, the Electricity Committee reported on a claim by Messrs. G. P. Cosway, Ltd., Nuneaton, for £881 in respect of thirty link boxes said to have been ordered by the former electrical engineer. It was stated that the consulting engineer (Mr. C. S. Davidson) had asked Messrs. Cosway to withhold delivery as it would not be possible to make use of them. The company had placed the matter in the hands of its solicitors and was claiming damages for breach of contract. It was recommended that the matter should be attended to by the Town Clerk.

Bus-bar Zone Protection. By T. W. Ross, A.M.I.E.E.

A study of four systems

IT is a curious anomaly that whereas much thought and ingenuity has been given to the design and application of protective devices for every other part of an electricity supply system very little attention has been given to the protection of bus-bars. This is probably due to the fact that electrical faults on switchgear are comparatively few and to the fear that protective devices may cause unnecessary tripping. Although switchgear forms a reliable part of every system, the possibility of an electrical failure cannot be eliminated. Since protective devices are now accepted as a necessity for the economical operation of supply systems, it is surely desirable to provide also suitable protection for the switchgear forming a part of the system.

Many engineers consider that ample protection for the bus-bars is provided by the overcurrent and earth-fault relays used to protect the apparatus and feeders connected to the bars. Such protection has very often proved satisfactory, but it always has the disadvantage that time delay is necessary for discriminating between faults on the bus-bars and faults on other parts of the system. There is also the possibility that under certain conditions the fault current will be limited to a fraction of its maximum value and may flow through several circuits in parallel, with the result that the overcurrent relays may fail to operate or operate comparatively slowly.

There are three reasons why time delay in clearing faults is undesirable, *viz.*: (a) increased disturbance to the system; (b) increased damage to the faulty apparatus; (c) increased risk of fire. The last contingency is, perhaps, the most undesirable in relation to bus-bar protection, particularly when indoor switchgear is under consideration. If quick clearance is catered for the possibility of fire following a bus-bar fault will be very remote and with the addition of suitable fire-proof partitions between each bus section there can be little or no danger of an extensive shut-down.

I believe that bus-bar protective schemes can be designed so that they are quite reliable and that it is necessary to protect only against faults to earth. Protective schemes confined to earth faults are less complicated than schemes which operate on both phase and earth faults and are generally more easy to apply to complicated bus-bar arrangements.

Discriminative action is, of course, an absolutely essential feature of bus-bar protection and it is also imperative that stability shall be maintained during all healthy conditions of the bus-bar, and during both normal and abnormal conditions on the rest of the supply system. Instantaneous discriminative protective schemes are chiefly of the balanced or differential type and in general such schemes can be successfully applied to the protection of bus-bars. Since there are several circuits connected to a bus-bar the most convenient arrangement for balancing the currents is the circulating current method having a multi-contact relay for tripping the several

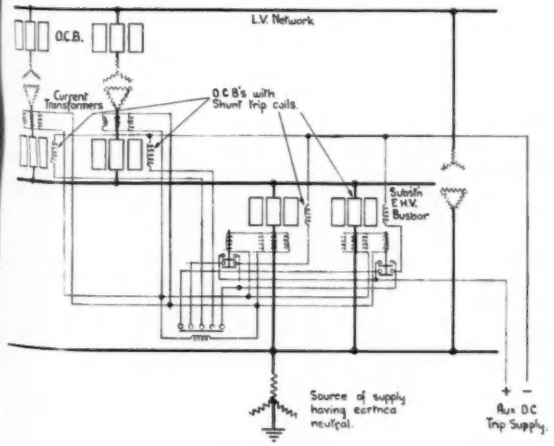


Fig. 1

circuit-breakers. This arrangement suffers, however, from the serious disadvantage that accidental operation of the relay or a failure of a secondary connection would cause the complete isolation of a healthy bar or, where section circuit-breakers are installed, a section of bus-bar.

A scheme for overcoming this disadvantage is sometimes employed consisting of an unrestricted earth fault relay for each separate circuit having its contacts connected in series with one of the contacts on the multi-contact relay. Inadvertent operation of the multi-contact relay could not therefore trip any circuit-breaker unless accompanied by the operation of the unrestricted relays on each individual circuit. Likewise a failure of a secondary connection which would upset the balance during an external earth fault would result in tripping only one circuit-breaker.

This may not be entirely satisfactory, because in some cases the bus-bar might be kept alive from some source of supply, the neutral point of which is insulated but from which a capacity current would flow to earth through the fault. An arrangement which trips all the circuit-breakers connected to a faulty bus-bar section is to be preferred. Probably the best

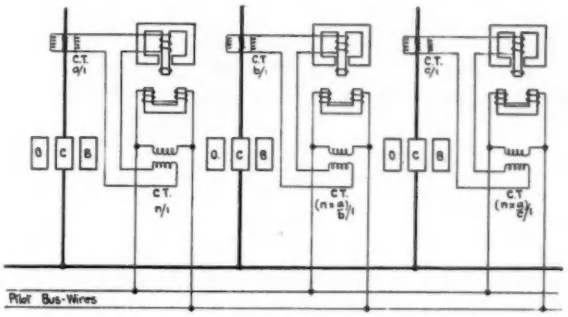


Fig. 2

and most convenient arrangement is to use double-contact unrestricted earth-fault relays for the circuit-breakers, which if closed must carry earth-fault current, and to arrange that the second contacts are connected in parallel and then in series with the common point of the trip supply to the multi-contact relay. Inadvertent operation of one relay would thus be prevented from causing unwanted tripping (fig. 1).

Another possible cause of unwanted tripping is a lack of balance between the secondary currents of the current transformers. It is comparatively easy to ensure that balance is maintained at normal load currents and also at small values of through fault current, and if the burden imposed upon the current transformers causes magnetic saturation, it is sometimes difficult to prevent unwanted tripping unless the relays are set for a high value of current. In an earth-fault scheme there need be very little burden imposed on the current transformers except during through earth faults, and it is therefore necessary to consider this condition only. If earth-fault current is limited by an earthing resistance or impedance no difficulty may be experienced, but where the neutral point is solidly earthed precautions have to be taken to ensure stability during through earth faults.

The "Translay System"

An improved scheme embodying features which prevent the possibility of the unwanted isolation of a bus-bar or bus section employs the well-established "Translay" principle of differential protection with the novel inductive balance which ensures stability on through fault conditions. This system is so designed that in the event of a bus-bar earth-fault the bus-bar or section of bus-bar will be completely isolated. The accidental operation of a relay which would cause a complete shut-down is avoided by providing a separate relay for each circuit-breaker. Because of the biasing feature operation on through earth-fault conditions is quite impossible even if the current transformers have somewhat different characteristics.

The three current transformers in each oil circuit-breaker associated with the bus-bar are connected on the core balance principle, the residual current passing through the coil of the upper electromagnet of the relay in series with the primary winding of an auxiliary current transformer. The secondary winding of this transformer is in parallel with the coil of the lower magnet of the relay and with an auxiliary bus-bar system. In the event of a through fault the currents entering and leaving the bus-bars will sum to zero. Consequently the currents in the secondary windings of the auxiliary current transformers will also sum to zero and will circulate through the auxiliary bus-bars, no current flowing through the lower coils of the relays. The relays will therefore remain inoperative, and will, in addition, be restrained by the biasing winding on the upper magnet which is a special feature.

When an earth fault occurs within the protected zone, the balance of currents will be disturbed and the out-of-balance current will flow through the lower coil of the relays which will consequently operate. A simple system of auxiliary switches on the selector switches ensures that the relay equipment associated with each circuit breaker is correctly balanced against the equipment on all other circuit breakers connected

to the same bus-bar. An important feature of the scheme is that the various circuits need not have current transformers of the same ratio, since the difference can be compensated for in choosing the ratio of the auxiliary current transformers. The scheme which is illustrated in fig. 2 has proved very successful in practice.

In the case of double- or multiple-bus-bar stations a separate protective equipment is used on each bus section. This involves the provision of two relays on the bus sectioning or

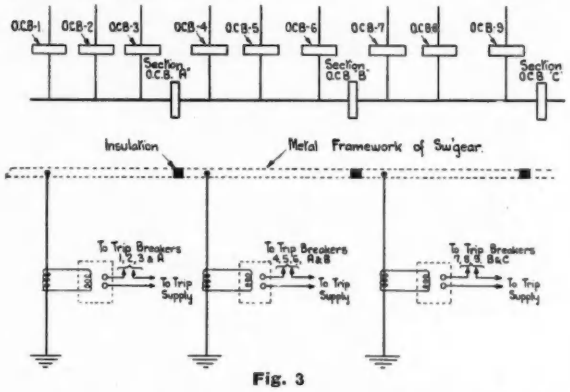


Fig. 3

coupling circuit-breakers and ensures complete flexibility with stability during through faults, and discrimination between healthy and faulty sections of the bus-bars.

Another method of bus-bar protection by which quick earth-fault clearance is possible is to connect a current transformer in the earthing conductor of the switchgear framework, and from it to energise the multi-contact relay to trip all circuit breakers connected to the bus-bar. If this method is to be effective sufficient earth-fault current must flow from the switchgear frame to earth through the earthing conductor, instead of through girders or other building material. Ordinary concrete foundations will offer sufficient resistance to ensure that most of the earth-fault current will flow through the earthing conductor.

Insulation is also required between cable glands and the switchgear framework in order to guard against any earth-fault currents from the feeder flowing through the framework and its earthing conductor. In the case of a single bus-bar without section circuit-breakers no further complication is necessary, unless it is considered desirable to include two relays in series to prevent unwanted tripping by the accidental operation of one relay.

Where section circuit-breakers are employed it is desirable to confine the tripping to those associated with the faulty section, since in this way continuity of supply may possibly be maintained. Probably the easiest method of doing this is to provide insulation between sections of the framework on either side of the section circuit-breakers, and to earth each section of the framework through current transformers. Each current transformer will energise a multi-contact relay to trip all circuit-breakers, including any section circuit-breakers associated with the faulty section of the bus-bar. The insulation between framework sections has only to withstand a low voltage, since a common earthing conductor will be used to join one primary terminal of each current transformer to the earth plate. The scheme is illustrated in fig. 3. The frame-leakage method is attractive because it is simple to install, provided that conditions are suitable, but it suffers from the disadvantage that if there should be a rise of potential on the switchgear frame the protective relay might operate and so cause an unnecessary shut-down.

A scheme which retains the desirable features of the simple frame-leakage gear, but overcomes its undesirable features, has recently been developed by the Met.-Vick. This scheme, illustrated in fig. 4, consists of special induction relays, one winding of which is connected to the current transformers on individual circuits, the other coils being connected in series to a quadrature current transformer connected in the earthing connection for the switchgear framework. Unwanted operation cannot now take place unless there is simultaneously (a) an earth fault on one of the circuits connected to the bus-bar, and (b) the switchgear-framework potential rises as a result of current which is in the correct phase relationship with the earth-fault current.

A further development of the scheme allows of discrimination between healthy and faulty sections of a bus-bar without the necessity of insulating the framework of the respective sections from each other. It is, however, still necessary to insulate the lead sheaths from the switchgear framework in order to prevent unwanted tripping due to earth-fault current from external faults.

Most of the schemes described have been successfully applied to important switchgear installations, and if care is taken

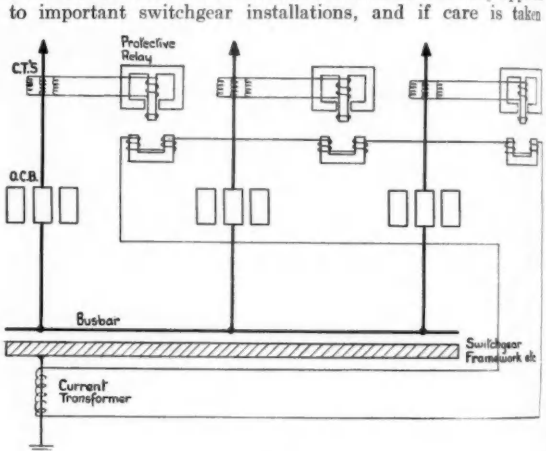


Fig. 4

to select a scheme which is suitable for the conditions there need be no more difficulty in protecting bus-bars than in protecting other parts of an electricity supply system.

Keeping Mains Records. By W. Buckley

The principal systems

AMONG the methods of keeping records of electricity distribution mains in use at the present time, the most popular are the ordnance map, road book and card systems. Some road books are kept in the form of sketches showing the full details of each main, obstructions (such as water mains, sewer pipes, &c.), and all necessary dimensions and drum lengths, the latter greatly facilitating the localisation of faults. Others contain only written descriptions of distributors and feeders. A combination of both these methods has a great deal to commend it.

Unfortunately, each page of the road book can only cover a very small area, and it is desirable that the mains engineer should have a bird's-eye view of the distribution network. This is where the standard ordnance sheet is superior. A set of 1/2,500 scale maps covering the total area has proved invaluable for both thickly populated and rural districts. The most popular method of entering mains records on them is to use distinctive colours for low- and high-voltage networks. Each service is usually marked by filling in the building with coloured ink according to its polarity or phase colour. Each distributor should be clearly marked as to size and type, and joints indicated by means of a large dot. Feeder pillars and link boxes should have their own distinctive marks.

In congested areas it is desirable to have larger-scale maps. Draughtsmen with a photostatic enlarger will experience no difficulty in transforming 1/2,500 scales up to double size or more, while in other cases a pantograph may be used. Another convenient method of enlarging maps is to use an ordinary photographic enlarger. The accuracy of the results that can be obtained is surprising. The method is to quarter a standard 1/2,500 scale ordnance sheet, make either a pencil or ink tracing of each quarter, and divide this into sixteen equal parts, numbering each and cutting them.

Each rectangle (approx. 5 in. × 3¼ in.) is used as the negative and is slipped into the enlarger between two sheets of glass. Having adjusted the apparatus so that the image is double the size of the negative, a tracing is made. These enlargements are then fitted together to make up a standard-size ordnance map and a linen tracing is secured. This, in turn, has prints taken from it, and these are mounted on either linen or strawboard before the records are entered on them. Such enlarged tracings can also be used for obtaining plans of particular areas for use in wayleave negotiations and for excavation notices, &c.

Very little need be said about the card system of keeping mains records, as it is similar to the road book system. Each extension is entered on a card, and these are filed either in numerical order or alphabetically, enabling the engineer to obtain full details of any extension in two or three minutes. Here, again, the need is felt of ordnance maps to back up the cards, as the numbered streets do not convey much without a view of the area.

What is a Safe Voltage? By T. C. Gilbert, A.M.I.E.E.

Tests with current from hand to hand

THE columns of some of the technical publications have recently contained widely divergent views as to what voltage should be considered the maximum for safety, and what really constitutes a safe current. One engineer has stated that he has often suffered the passage of 100 to 150 mA through his body without permanent damage, and, indeed, one gathers, almost with enjoyment! Present knowledge in this country can give no guide as to what is, and what is not safe, although the tenth edition of the I.E.E. Regulations visualises 50 V as approaching the limit. No specified values are, however, known to exist.

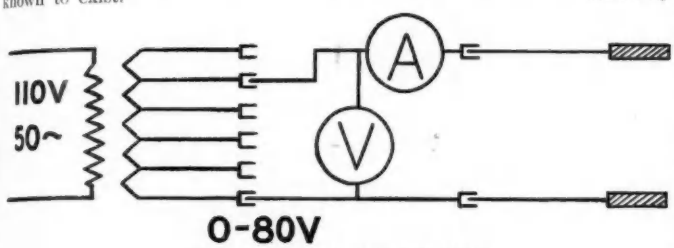


Fig. 1.—Apparatus used for tests

The Elektrizitätswerken des Kantons Zurich some years ago carried out tests on twenty-five people (of both sexes) in order to ascertain, if possible quantitatively, the danger of currents at 50 cycles to the human body. The resulting document points out that, in deducing the safety of any given situation, all accompanying circumstances must be taken into account, such as current, voltage, resistance, contact surface and psychological conditions. Tests show that the sensations experienced agree in most people with the same current, but that ohmic resistance varies within wide limits, not only with different people, but with the same person. Dangerous current is defined as that at which the person concerned is unable to release himself from contact—a very sound definition. With the passage of current from hand-to-hand, holding brass electrodes 20 mm. in diameter and 160 mm. long, this current was found to be about 15 mA.

Body resistances of hand-to-hand, or hand-to-foot, of 2,000 ohms are common; under unfavourable conditions, *e.g.*, in chemical works and house cleaning with soda lye, body resistances of 1,500 ohms occur. The maximum safe voltage for the most sensitive people, under unfavourable circumstances, with current passing from hand-to-hand, is with dry hands about 30 V, and with wet hands about 20 V; for a person in a bath who can touch a current-carrying article the figure is about 10 V.

With a view to deciding whether better protection is obtained by retaining the earthing of networks or by neutralising apparatus, the Swiss undertaking referred to carried out detailed tests on current passage through the human body and its relationship to the voltage. These tests were continued through the year 1928, and obtained impetus from measurements and observations by Professor Weber recorded in the S. E. V. In compiling the new regulations there was uncertainty as to what voltage should be considered as dangerous. The 100 V given in Section 11 of the new Regulations appeared too high, and even the 50 and 36 V specified in Sections 15 and 224 seem unsatisfactory in certain circumstances. The conclusions drawn from Professor Weber's tests may lead to an underestimation of the danger of current through the human body, in general, and as the same voltage cannot be regarded as equally safe for all persons, and even the same person reacts differently to the same voltage under different circumstances, definite conclusions cannot be drawn. Taking Professor Weber's particulars in experimenting upon himself, and determining the voltage, current and resistance hand-to-hand, we have the results shown in Table I.

These tests show that Professor Weber ran considerable risks in view of accidents that have since occurred at 50 V, and it was thought inadvisable to repeat these risks.

Attempts have been made in the past to characterise numerically the limit of safety, voltage being taken as a scale of measurement; observations which have been made of accidents have shown, however, that voltage is not alone the deciding factor. Recently assumptions have been made that current flowing through the body provided the real danger scale, but neither method is satisfactory. The safe limit cannot be determined by means of a single value, as so much depends upon the accompanying circumstances—contact surface, current, voltage, and resistance—the relationships of which have to be taken into account.

When a value for safe voltage is specified in regulations there must be certainty that at this limit there is no danger. The E. K. Z. endeavoured to find a criterion for the limit of safety on a.c. 50-cycle installations, any situation in which the victim cannot release himself from contact being considered dangerous. Tests were also made to determine if possible when this condition occurred in each case, and to determine the phenomena on the passage of current.

As prior tests showed that resistance measurements with a bridge led to no results of value, the tests were decided by means of current and voltage measurements. In order to avoid risks, a step-down, double-wound transformer was used, the secondary winding being tapped from 0-80 V as further protection for the person under test; the electrode connections were taken to easy-fitting plugs, which could be instantly withdrawn by the person under test or others (fig. 1). A Weston voltmeter and an ammeter of the dead-beat type, reading from 0-15 mA, were used. There was a short pause of ½ to 2 minutes after each test before the voltage was increased to the next step.

TABLE I.

Voltage.	Wet Hands. Current A.	Wet Hands. Resistance Ohms.	Dry Hands. Current A.	Dry Hands. Resistance Ohms.
10	0.001	10,000	—	—
20	0.0022	9,100	—	—
30	0.0135	2,220	—	—
40	0.0205	1,955	—	—
50	No reading possible, too painful.		0.0001	500,000
60			0.0008	75,000
70	—	—	0.0018	38,900
80	—	—	0.0100	8,000
90	—	—	No reading possible, too painful.	

Preliminary tests had shown that the resistance of individual people varied considerably, but that the sensations experienced at the same current strength were similar. From this it may be assumed that current strength is the deciding factor, voltage playing a minor part, subject to the limitation that tests at low voltage cannot be taken as applying to high-voltage conditions. Table II gives the results of tests as to average sensations experienced by the persons under test, in relation to the current strength. The flow of current was from hand-to-hand, brass electrodes 20 mm. in diameter and 160 mm. in length being grasped in each hand.

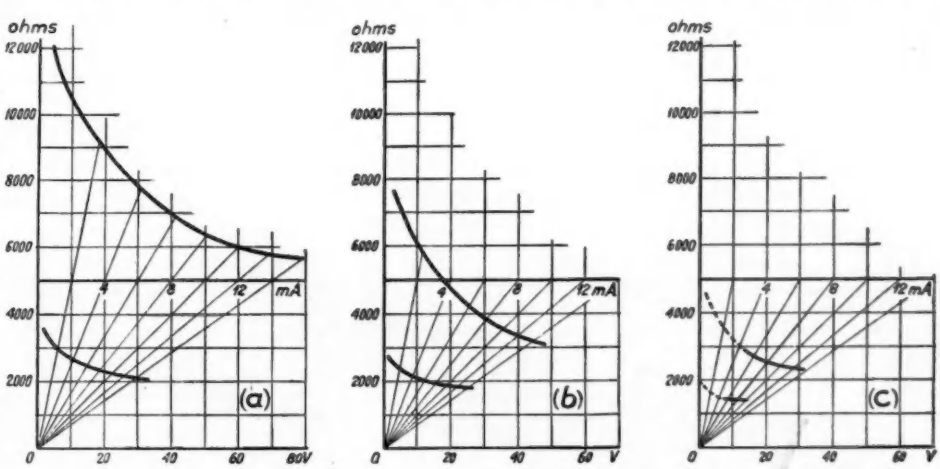


Fig. 2.—Body resistance: (a) dry hands; (b) moist hands; (c) hands moistened with soda lye

The above particulars apply when the person under test is prepared for switching on. Should accidental contact be made, there is in addition to the current effect the effect of

shock; conditions are then worse, but tests are hardly possible in this direction.

Taking first of all the qualitative properties, the resistance value of the human body is dependent upon a series of influences, which again are to a great extent dependent upon one another. It is composed of skin resistance at points of entry and outlet of current and internal body resistance, all in series. In the present tests body resistance is not considered, as it is very small compared to skin resistance.

The skin resistance itself depends upon three factors, r, d and f (r=specific resistance, d=thickness of skin and f=surface of skin through which current penetrates, or contact surface), the relationship being $R=r\ d/f$; r and d vary with the same person at different parts of the body, so that with different people substantial differences are to be expected. With a view to securing as nearly as possible the same contact surface in all the persons tested, the same electrodes were used by all and grasped in a similar manner. The variations of r and d cannot be separated, and I therefore deal with the variations influencing these values. The most important and practically the only condition which influences the skin resistance is the moisture of the skin.

Skin moisture and its influence on the electrical conductivity of the body can be controlled by external effects. It increases, for example, with increasing air moisture, rising temperature, by moistening with water or other liquids, the conductivity of the liquid playing an important part. These conditions apply mainly to bathrooms, kitchens, cellars and chemical works. Skin moisture is also influenced by a number of internal phenomena, which have the common effect of separating perspiration from the sweat glands—a very complicated process. The *S.E.V.* has appointed a medical commission to confirm the following observations. Perspiration forms by reason of manual labour and high temperature; with some people it is caused by shock and fear, so that physiological and psychological conditions can have a great effect upon the value of body resistance.

When a person comes into contact with a live circuit, the current that flows is dependent upon the voltage and his resistance. It is immaterial whether contact is intentional or accidental, as for the first moment only his initial condition, or initial resistance, is the deciding factor, and this is the result of the external and internal effects described. From the moment of contact, however, physiological and psychological results of the current flow occur, the former affecting the muscles, which with increasing current contract with cramp.

TABLE II.

Current in mA.	
0—0.9	Nothing felt.
0.9—1.2	Just noticeable at point of contact.
1.2—1.6	Tickling sensation in hand.
1.6—2.2	Hand "goes to sleep."
2.2—2.8	Noticeable in wrist.
2.8—3.5	More noticeable.
3.5—4.5	Still more noticeable; tired sensation in forearm up to elbow; first sensation of pain in sensitive people.
4—5	Feeling of cramp in hands; hands trembling.
4.5—5.5	Cramp in forearm.
5—7	Slight cramp in upper arm, generally found unpleasant.
6—8	Hands stiff and cramped, release from circuit difficult; pain on grasping the electrodes.
8.5—9.5	Increased cramp in upper arm.
9—10	Unpleasant general cramp.
11—12	First cramp in shoulders; contact only about 30 seconds.
13—15	Difficult to release electrodes.
15	No longer possible to release electrodes; contact only 15 seconds.

The psychological effect is the irritation of the nerves, caused by surprise or fear, and according to its extent the value of body resistance will vary. That care plays an important part is proved by there being little fright when there is no surprise, so that less perspiration is formed with little consequent alteration from the initial resistance. In the tests an interval of at least half a minute between each measurement was given in order to give the organism time to recover. All measurements lie between the limit curves, and current density was from 0.0166 mA per sq. cm. with 0.5 mA to 0.4666 mA per sq. cm. with 14.0 mA. The voltage drop in the ammeter was taken into account in all cases.

With dry hands initial resistances are of the order 12,000 ohms—one exception was 30,000 ohms—down to 3,300 ohms. The term "dry" hands is therefore a wide one, as some hands are permanently moist. For the maximum current of about 15 mA, at which it is difficult or impossible to release the electrodes, the resistance falls from 5,700 ohms to 2,200 ohms. The physiological effects of the current are then such that the hands are no longer dry; even persons used to heavy manual labour, and with thick horny skins, perspire at the point of contact. Should the hands be moistened with ordinary spring water, the hand-to-hand resistance with initial values of 7,500 to 2,800 ohms falls to values of 3,200 to 1,800 ohms at 14 mA. The variations between people with moist hands are considerably less than between those with dry hands. Finally, tests were made with soda water, with a further reduction in resistance and variations.

The curves in fig. 2 represent generally limit curves. The curves are, however, not strictly parallel; for example, the upper curve for moist hands may not give an upper curve for the same person with dry hands. The curve for a person with dry hands may be in the middle range, and for wet hands may reach almost the upper limit. The curves show that even less than 20 V may be dangerous.

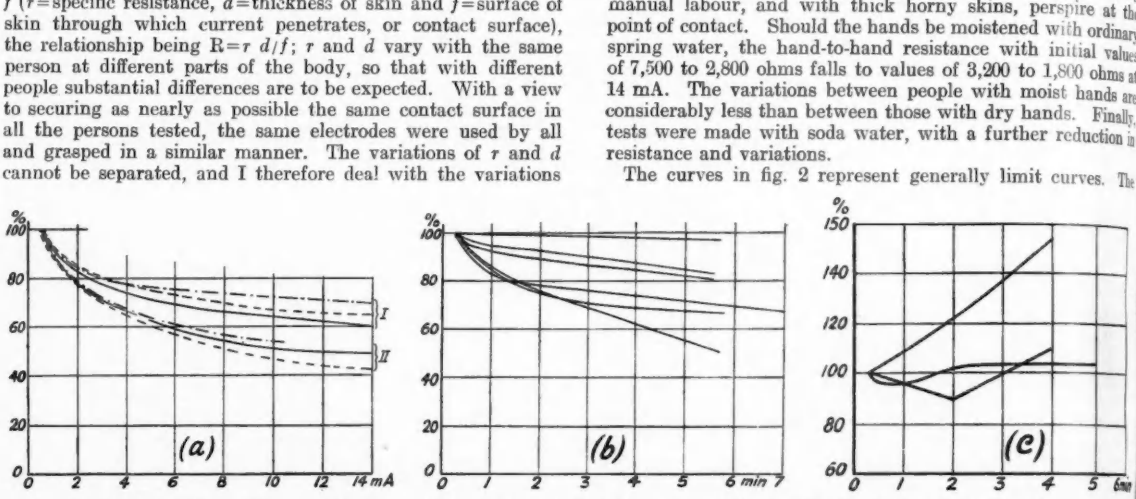


Fig. 3.—Variation from initial resistance: (a) with increase of current (I moist hands, II dry hands); (b) with extended time of current flow; (c) with extended time in exceptional cases

In one test, the results of which could not be reproduced, one person, tested for the first time (at only 3.5 V), had such a fright that a resistance of scarcely 1,000 ohms was recorded, but in further tests the resistance rose to within the general limits. The result indicates the low resistance that may result from shock, independent of the voltage applied, and explains occasional fatalities on low voltages. In the curves showing the resistance variations (fig. 3) the initial resistance, is taken at 100 per cent. It falls to about 60 per cent. with moist hands and 50 per cent. with dry hands. The values for washed hands are 65 per cent. and 42 per cent. and for hands moistened with soda lye 70 and 50 per cent.

Extension of time of current flow acts in a similar manner to increase of current, probably because with medium electrification there is a locally concentrated effect on the muscles which releases local perspiration, leading to reduction in resistance. Light electrification of long duration appears to have the same influence on the resistance as heavy electrification of short duration. The assumption that fatigue, bodily health and will power have any influence remains to be proved.

A Village Clock

An electric turret clock of unusual form has just been set going in the church of Sampford Arundel, near Taunton. The limited space available in the church tower was insufficient for a clock of the usual type, so two gilt skeleton dials, 5 ft. in diameter, are now operated by step-by-step mechanisms from an electric master clock located in the vestry, which transmits half-minute impulses. Although powerful enough to drive the hands through all weathers, the dial mechanisms are small enough to be situated at the dial centres, and are made detachable for rapid cleaning or adjustment. The fact that rods and bevel-wheels are dispensed with makes this arrangement particularly suitable to the limited dimensions of the tower. The hour-striking unit, which is placed in a small space between the belfry and the ringing chamber, is weight-driven and hand-wound, but is released electrically by the master clock at each sixtieth minute through mechanism similar to that fitted to the dials, but carrying a trip-pin which unlocks the striking train at the proper intervals. The novel design of this installation was rendered necessary by the remote position of the village, for there is no electric power supply available, The master-clock, which has an "invar" seconds pendulum, is driven by a battery of dry cells, these also supplying the power for impulsing the dials and releasing the striking mechanism. The installation was presented to the church by Mr. G. W. Gilchrist, a local resident, and was constructed and erected by the Synchronome Co.

Air-conditioning for Existing Hotels

A plenum system using flues as ducts

TO provide a plenum system of air-conditioning in existing premises at first sight appears impossible short of extensive rebuilding. At the Savoy and Berkeley Hotels, London, the problem has, however, been ingeniously solved by Mr. F. C. Pay, chief engineer of Savoy Hotels, Ltd., who has had the idea of utilising the flues as ducts. After being washed, dried and heated by means of a J. Jeffreys & Co.'s air-conditioning plant, the air is passed into trunking connecting up with the chimney stacks which have been cut off short. The trunking is lagged with 2 in. of cork and cemented over, and dampers are provided on each main branch to regulate the air flow. Steam boosters inserted in the ducts at various points maintain the air at the desired temperature.

Wire brushes, followed by sacking covered with lime, were used to remove the soot from the flues, and to make sure that no objectionable odour remained an " Ozonair " plant has been installed temporarily. The bottoms of the flues have been stopped off above each fireplace and the inlets to the rooms have been cleverly concealed behind dressing tables, wardrobes or other pieces of fitted furniture. In the case of some of the sitting rooms the fireplaces have been retained and " Sunray Tricity " fires (L. G. Hawkins & Co., Ltd.) inserted for decorative purposes, the air inlets being hidden behind slightly projecting overmantel mirrors which also serve as settings for electric clocks (Smith's and Magneta).

In the carrying out of the alterations and improvements the opportunity has been taken to incorporate a number of attractive lighting effects, including cornice lighting; the fittings were specially made by Messrs. F. H. Pride to the design of the architects, Messrs. Stanley Hall & Easton & Robertson, the electrical work being carried out by Messrs. T. Clarke & Co., Ltd.

Provision is made for eight air changes per hour (150-180 cu. ft. per minute), though unobtrusive hand-control knobs in each room enable air flow to be regulated if desired. Small louvres in the bottom of the doors allow the air to pass into the corridors and so to the lobby, whence ducts concealed behind the false ceiling link up with large paddle-box fans on the roof. As an integral part of the scheme double steel casements with thick plate glass have been fitted in every room. This, besides making the building practically air-tight, excludes exterior street noises.

Sections of the air-conditioning scheme at the Savoy Hotel, London. Left: The Jeffreys air washing, drying and heating plant. Centre: Lagged trunking leading to the cut-down chimneys. Right: A dressing table concealing an air inlet

Special Motor Windings.

By E. K. Bottle, B.Sc., A.M.I.E.E.

The changes involved

THE object of motor design is to strike a balance between a number of interdependent, and often mutually opposing, quantities which fall into the following groups: size, weight and cost; starting torque and overload capacity; efficiency and temperature rise; power-factor; noise.

Manufacturers put out standard lines to give the best all-round compromise. For any particular job, however, they may be of unequal importance—loss in one being more than offset by gain in others. Such special conditions can usually be met by modifying the standard machine. In a few cases a major variation, such as different core length, may be required, but generally only the windings are altered. By this means the flux may be either increased or decreased relatively to that in the standard machine. It may be noted in passing that any motor becomes overfluxed if run above its rated voltage; this can sometimes be turned to advantage for a makeshift, *e.g.*, a standard 200-V machine will exhibit the qualities of an overfluxed one when put on 230 V.

A complete analysis of the effects resulting from a non-standard flux is only possible when full design details are available, but the general trends can be forecast. The changes involved can be visualised if the various quantities are represented by the spokes of a wheel, which is a true circle for the standard machine but which becomes distorted when the windings are modified to meet special requirements. This is illustrated in the next page.

The following cases can be considered in more detail: Overfluxed with standard output; overfluxed with increased output for reduced time; underfluxed with standard output; underfluxed with reduced output; and normal flux with reduced output.

Increasing the flux improves the starting torque and overload capacity at the expense of power-factor, efficiency, and noise. The decrease in efficiency leads to higher temperature rises so that, if the standard machine is fully rated, the overfluxed one must be given a short-time rating. Magnetic noise is also liable to increase rapidly after a certain critical value of flux is passed. Due to the high magnetising current and losses resulting from saturation in the iron circuit useful overfluxing is limited to 15 or 20 per cent.

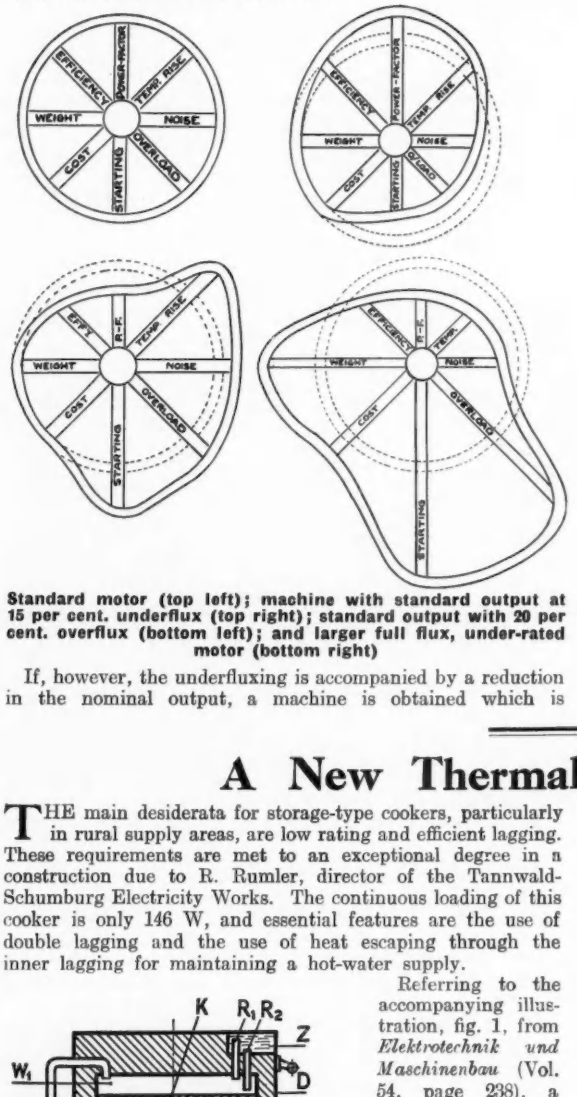
The overfluxed motor can be considered from two aspects. If the standard nominal output is retained the starting and overload expressed in terms of full-load are increased. On the other hand, by maintaining the normal ratio for these quantities the nominal output for the frame may be increased. It is essential to reduce the time rating in the latter case.

Typical applications of the overfluxed machine are:—Portable tools of the grinder class where low weight is at a premium and high stalling torques are needed; machine tool drives where there are space restrictions and high peak loads, interspersed with periods of low loading; caterers' machinery, which requires high starting torque and overloads to clear stoppages, but is only intermittently rated; air compressors feeding high-pressure reservoirs and not provided with release valves; and washing machines, wringers and ironing machines.

Underfluxing quietens a machine up to a point, but decreases the starting torque and overload approximately as the square of the flux. Power-factor is improved and temperature rise decreased. A gain in efficiency is usual. As in the overfluxed motor there are two distinct cases, according to whether the nominal output for the particular motor frame is unchanged or not.

Uses for the underfluxed standard motor are few owing to its poor overload capacity. Its chief application is for fans,

particularly those connected to trunking systems inside buildings where quietness is essential, starting requirements are low, and overloads cannot occur.



Standard motor (top left); machine with standard output at 15 per cent. underflux (top right); standard output with 20 per cent. overflux (bottom left); and larger full flux, under-rated motor (bottom right)

If, however, the underfluxing is accompanied by a reduction in the nominal output, a machine is obtained which is especially suited for operating at high load factors. For example, where a load has a duration of 700 hr. or more per annum the capitalised value of improved efficiency and power-factor may justify the extra cost of a slightly larger, underfluxed, machine. This would have starting and overload performance equal to the standard for the same output together with improved power-factor and efficiency, lower temperature rise and greater quietness. Such a machine, which has been given the name "long-hour" in the United States, is ideally suited for installations using a large number of individual drives, particularly if the supply tariff is favourable towards high power-factor. Technically, it is also the most desirable for domestic refrigeration and stoker work, but its somewhat high first cost often prevents its adoption.

In situations where reliability is imperative, such as where the failure of one small auxiliary would cause an expensive shutdown in a large plant, the underfluxed, under-rated motor is sometimes specified with a view to increasing the factor of safety.

Fully Fluxed, Under-rated

If a standard machine is run on a load below that which it can carry continuously from a heating point of view it is said to be under-rated. In this case the starting and overload performance relative to the actual load are higher than standard. Size, weight, and cost are all increased, while the power-factor is lower. The temperature rise is reduced even though the efficiency may be worse. Noise may be less than standard though more than on an underfluxed machine.

This type of under-rated machine finds its most useful application where the local ambient temperature is too high to allow the use of a machine having a standard temperature rise.

In cases where constancy of speed is of importance an under-rated induction motor, running at low slip, may be used as a near substitute for a special synchronous motor.

A New Thermal Storage Cooker

THE main desiderata for storage-type cookers, particularly in rural supply areas, are low rating and efficient lagging. These requirements are met to an exceptional degree in a construction due to R. Rumler, director of the Tannwald-Schumburg Electricity Works. The continuous loading of this cooker is only 146 W, and essential features are the use of double lagging and the use of heat escaping through the inner lagging for maintaining a hot-water supply.

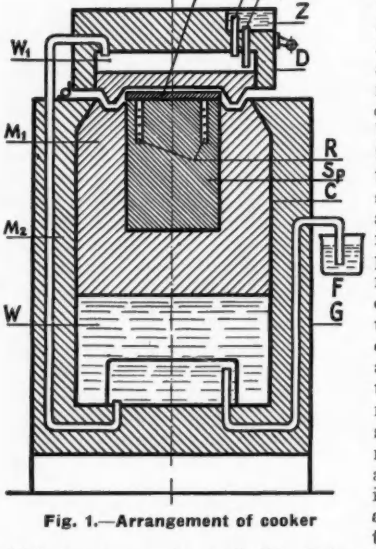


Fig. 1.—Arrangement of cooker

Referring to the accompanying illustration, fig. 1, from *Elektrotechnik und Maschinenbau* (Vol. 54, page 238), a nichrome heating element R insulated by steatite beads is fitted in a groove in the 150-lb. cast-iron storage block S*p*, above which there is the cooking hot-plate K, capable of rotation on a series of tapered segments to alter the rate of heat transference and thus adjust the temperature to suit requirements. The storage block is mounted in a thermal insulating mass M_1 inside a copper shell C, the lower part of which forms a water tank W. Between C and the outer casing G there is a layer M_2 of thermal insulation, which can be of cork or other highly efficient material as it is never exposed to a temperature exceeding 212 deg. F. The hinged top cover D is built on the same principle, with a water space W_1 between the inner and outer thermal insulation.

An important feature is the thermo-siphon action arranged in D to eliminate any danger from steam formation and to provide for transfer of heat to the main tank W. Steam forming in W_1 flows to W, and is there condensed. If the water level in W_1 thus falls below the bottom of R_1, steam enters Z and water flows thence through R_2 into W_1, condensing the steam therein and producing a suction which draws water from F into W, after which W_1 again heats up and transfers steam to W. This arrangement prevents any overheating of the cover and also ensures that the water jackets can never boil dry.

The storage capacity of the block S*p* on the basis of a weight of 150 lb., sp. ht. 0.12, and temperature range, 180 deg. F., from 752 to 572 deg. F., is $150 \times 0.12 \times 180 = 3{,}240$ B.th.u. The heat throughput per diem is much greater, the block being repeatedly heated and partially cooled, as shown by fig. 2 in which t_1 relates to the temperature of the top, and t_2 to that of the bottom of the storage block, and t_3 to the temperature of the water in the lower tank; and A, B, C refer respectively to morning, midday and evening meals.

The heat flow to the cover is only 147 B.th.u. per hr.,

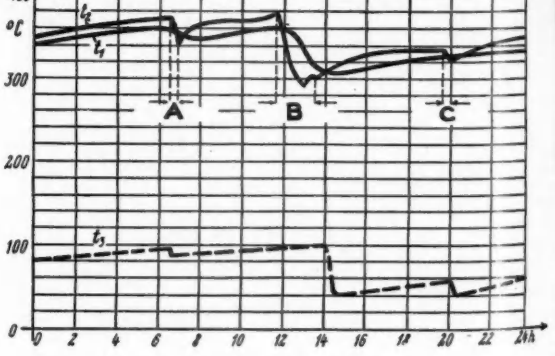


Fig. 2.—Operation curves for 24 hours

equivalent to 0.043 kWh, or about 1 kWh per 24 hr. At 146 W continuous loading the consumption is 3½ kWh per 24 hr., which supplies about 7½ gall. of water at 149 deg. F. (about 2.1 kWh), leaving 1.4 kWh for cooking, which is said to suffice for three persons. This stove provides only one hot-plate. If desired it can be supplemented by a direct-acting grill or oven, but experience during two years of experimental work indicates that about 80 per cent. of the total consumption of such a combined equipment is in the storage cooker and that the diversity factor of the remaining 20 per cent. (largely at week-ends) is such that it does not add to the peak loads of the supply system.

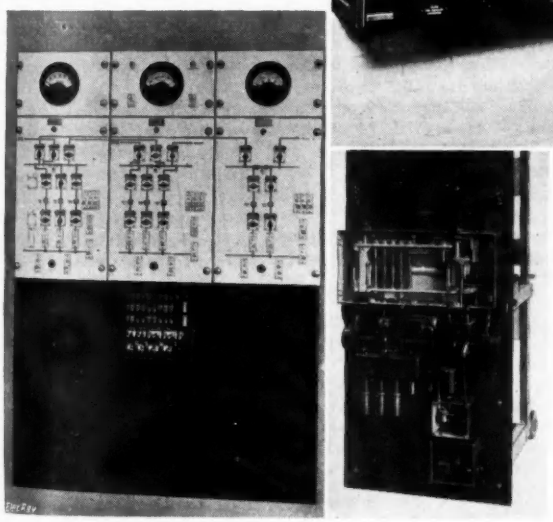
Supervisory Control at Ipswich

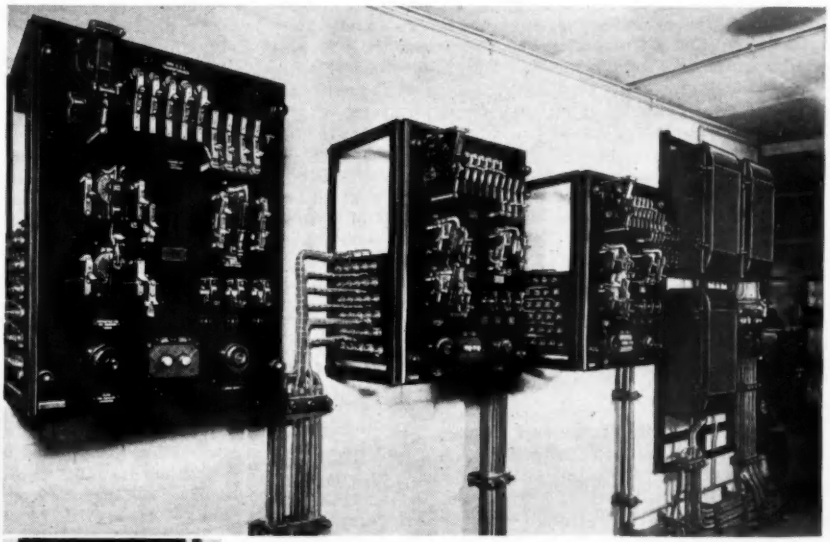
for three transformer sub-stations

REMOTE supervisory control for the operation of oil circuit-breakers and the regulation of low-voltage feeder voltage on an a.c. distribution system has recently been put into commission at Ipswich (borough electrical engineer, Mr. H. Blackiston). Three new transformer sub-stations have been linked to the control room in the main power station by a supervisory system, which was designed and manufactured at the telephone works of the General Electric Co., Ltd., Coventry, while the transformers and much of the sub-station switchgear were also manufactured by the G.E.C. at Witton, and a further contract has been received by the G.E.C. for extending the supervisory control system to a fourth sub-station.

The 6,600-V incoming supply is stepped down to 415 V by eight transformers of 1,000, 500, and 250 kVA.

Type "D" on-load tap-changing gear is employed and operates on the "preventive auto" principle. The selector switches are designed for the full breaking capacity, so that diverter switches are not necessary, and the selectors are operated by a series of powerful springs, compressed by a small motor (supplied at 230 V from an operating transformer) giving quick make-and-break characteristics. All the tapping switches in each station are gang-operated.





Left: Main supervisory control panel at Constantine Road power station. Right: A 6,600-V oil circuit-breaker panel, showing operating mechanism

The first transformer to be put on load establishes itself automatically as the master; when tap-changing is required, the tapping member on the master is first raised or lowered, and a self-levelling device then raises or lowers all the other tappings to match. There is no necessity to switch the transformers in or out in a prearranged order; and if the master at any moment is taken off load, one of the other transformers operating in parallel with it automatically becomes the master in its place. Means are provided to isolate the control circuits of a transformer that has to be taken out of commission for inspection and overhaul.

The oil circuit-breakers controlling the high- and low-voltage sides of the transformers are closed by small motors mounted on the front of the panels and fed from the 5-kVA operating transformer mentioned previously. These small motors compress banks of springs which, when released, close the switch contacts. The breakers are tripped by a 50-V battery, which is trickle-charged by a small metal oxide rectifier.

The stations are linked in tandem by four pilot wires over which control, indication and telephone facilities are obtainable. The control engineer can close or open or ascertain the position of any of the high- or low-voltage transformer switches; ascertain the position of any of the high-voltage switches; control the on-load tap-changing gear on any transformer; and ascertain the position of the tapping on which any transformer is working. He can also ascertain the low-voltage busbar voltage in any sub-station and at any feeder point (where pilots are available) and the low-voltage output amperage from any transformer.

In addition, a "firing" key is provided to enable all the low-voltage transformer switches in a sub-station to be closed simultaneously when they have been tripped by a momentary overload, as the load may be too great to allow individual circuit-breakers to be reclosed singly. If any sub-station switch changes position (either automatically by the operation of a protective divice or by manual operation) the equipment automatically gives an alarm and indicates the change that has taken place.

The supervisory equipment consists entirely of telephone-type apparatus, working on a "check-back" principle with a mimic diagram on which control keys and indicating lamps are mounted at the points corresponding to the switchgear which they represent. The whole of the supervisory gear is operated from 50-V trickle-charged batteries installed at the control station and at each sub-station. The sub-station batteries are also used for tripping the circuit-breakers.

Supervising control cabinets (right) and on-load tap-changing control panels at Major's Corner sub-station

Direct meter indications are given on a voltmeter, ammeter, and tap-changing indicator mounted at the top of the control panels; the meter currents are transmitted over the pilots by means of special auxiliary remote metering transformers, designed so that the secondary winding can be open-circuited without any appreciable rise in voltage.

Studying Heating Problems

A new laboratory for research on the heating of buildings has been completed at the Building Research Station of the Department of Scientific and Industrial Research so that work can go on all the year round, instead of only in the winter, quite independently of the vagaries of British weather. The laboratory was formally opened last week (July 22nd) by Sir Frank Smith, Secretary, Department of Scientific and Industrial Research, on the occasion of the annual visit to the Building Research Station of the Institution of Heating and Ventilating Engineers, which is providing a sum of £1,500 to enable the studies of heating problems at the station to be speeded up and extended. The laboratory is really one room within a larger room. The smaller room, which is 18 ft. by 12 ft., is the test-room which is to be heated in all the different possible ways. It has a ceiling which can be raised or lowered so that both low rooms and high rooms can be studied. The larger room in which the test-room is situated isolates it completely from outside weather effects. The various walls of this outer enclosure can each be refrigerated and their temperatures can be controlled to one-tenth of a deg. F. The test-room is thus exposed to constant "weather" and so requires a definite amount of heating to bring it to a comfortable warmth. This means that different methods of heating can be readily compared. Modern heating methods have been utilised in the control of the outer enclosure. Every surface is panel-heated or panel-cooled by brine which circulates in pipes in the walls, floor and ceiling. For cooling the brine which refrigerates the walls, a 4½-ton ammonia compressor is installed in the engine-room at one end of the laboratory. At the other end is an instrument room, where records are made of the conditions in the test-room and its enclosure.

Correspondence

Contributions from readers are welcomed. The writer should give his name and address, not necessarily for publication

Lamps and Voltage Variations

Since the widening of the tolerance allowed above and below the declared voltage of a distribution system, I have been wondering if the manufacturers of electric lamps have considered what can be done to improve these lamps in such a way as to make their light output less influenced by voltage changes, especially when it falls. Has this been seriously considered? G.L. PAYNE.

Matamata, N.Z., *June 25th.*

Propaganda on Pillars

I read under the heading "Electrical Propaganda at Tynemouth" of posters affixed to feeder pillars and whilst fully appreciating Mr. Glen's desire to obtain publicity for his supply generally, I cannot but feel that his method is going to create undesirable complications. We, as an industry, are given the right to break up streets "for the purposes of supplying electrical energy," and I am of the opinion that the use of our various overground erections for advertising purposes is one to which local authorities and county councils are bound to raise objections.

Furthermore, I believe that the trend of local authorities in the future will be towards forcing the supply undertaking off the road verge or pavement on to private land for its pillar sites. I consider that this step should be strenuously resisted, but we shall not by any means improve our case at an inquiry if we have been in the habit of using pillars as advertising hoardings. E. F. WESTWOOD,

Aldershot, *July 25th.* *Senior Technical Assistant,* Mid-Southern Utility Company.

The McGowan Report

The McGowan Committee on page 22 (paragraph 114) of its Report states under the heading "Personnel" that it is of the utmost importance that, with a view to ensuring that undertakings should be operated and managed on the most efficient basis, the chief executive officers of the undertakings should be men of the highest qualifications.

I suggest that the Committee should have included in its recommendations that the appointment of electrical engineers, particularly for municipal undertakings, ought to be subject to the approval of the Electricity Commissioners, because, apart from qualifications, the Commissioners are in a position to know whether or not the individual concerned is the man for the job. F.F.P.

July 27th.

The Report and Sales Development

The article by Mr. Swale on "Future Sales Development" in your current issue attempts to correlate future development to the recently published McGowan Report. Has it not struck Mr. Swale as more than strange that this supposedly independent Report employs the same language, the same terms, the very same arguments which have been advanced "in and out of season" by certain supply engineers?

It is quite clear that the Report is not founded on commercial efficiency, and many of Mr. Swale's views regarding sales development will fail to materialise because the programme will be the same although under different auspices. The recommendations are based on size and other considerations are of secondary importance. Size has little to do with efficiency, although this Report makes the elementary mistake of assuming that the one is the complement of the other.

Mr. Swale's observations regarding the standardisation of tariffs follow the usual lines, but they merely touch the fringe of the question. Before one begins to talk about standardised tariffs or selling prices one must be sure that standardised bulk-supply charges or cost prices are available to the purchasing authorities. If bulk-supply costs were standardised initially, the way would be clear for a declaration of standardised tariffs or selling prices, with an approved margin between cost and selling prices which would admit of profitable working along economical and efficient lines. Those undertakings which could not carry out their commercial obligations within the margin allowed would then suffer the fate of any ordinary business concern which fails to withstand competition and there would be grounds for compulsorily winding them up.

A word or two seems desirable regarding the hackneyed phrase "parish-pump traditions, etc.," to which Mr. Swale also refers. There can be such a thing as a "City pump" also. The large undertakings have been fortunate to retain their stations at all costs and their citizens now enjoy the privileges of selected station prices—but only at the expense of the less fortunate undertakings compelled to purchase at ordinary grid tariffs. More often than otherwise, the less fortunate have to get down to selling prices comparable with those of the more fortunate undertakings and their methods, I suppose, inspire the term "parish pump," which may in future become the regional pump.

Again with regard to centralised purchasing, &c., there is less in this than meets the eye. Apart from the reasons stated by Mr. Swale, anything short of standardising consumers would effect little improvement. Methods must vary with localities and habits and what seems suitable for London often produces indifferent results in other parts of the country. My undertaking has developed a satisfactory water-heating load by means of wash-boilers and 6-pint kettles. It seems of small account to assume that the ways and means are unsuited and that say immersion heaters should be standardised, seeing that the undertaking hires out three kettles to every four consumers. Very probably not more than 5 per cent. of the consumers served by undertakings which favour standardisation have immersion heaters.

Finally, with regard to the major recommendation of the Report, one very important aspect appears to have escaped attention. Let us consider such an amalgamation as is proposed. "A" and "B" are neighbouring towns, "A" sells 11,000,000 kWh per annum and "B" sells, say, 5,500,000 kWh. Both have different local rates and taxes, water charges, &c. Now amalgamate "A" and "B" undertakings and visualise the probable result. "A" supplies electricity throughout both districts, but it only draws rates, taxes and water charges, &c., from "A" district as before, leaving "B" to work out its own salvation. But any new industry coming into either district and wishing to adopt electricity for power requirements must first get into touch with "A" and it is safe to say that inducements will be offered the consumer to put his factory in "A's" district so that that authority may increase its rateable value and incidentally provide employment for its ratepayers. "B" would gradually become a back number and would tend to stagnate so far as the electrification of newer industries was concerned, if it merely stood still and looked on. It might even have to encourage private generation among the industrialists, if it led to employment for its ratepayers.

Electricity Committees and their engineers have no illusions regarding the responsibility of those in authority for creating the chaotic situation over which they now grieve officially and in public, while endeavouring to restore confidence by seeking outside opinion to make recommendations for the restoration of order. What a pity the equity clauses of previous legislation have been allowed to lapse when matters of this nature are under consideration. JAMES RATCLIFFE.

Whitworth, *July 27th.*

Electricity as a Curative Agent

IN the course of the proceedings at last week's conference of the British Medical Association Dr. W. J. Turrell (Oxford) raised the subject of electro-therapy. As reported in the *Manchester Guardian* he said that if electricity was of no use in the treatment of disease it was not the fault of the agent but of the neglect with which it had for so long been treated by the medical profession. It was owing to neglect and indifference on the part of the medical profession that the suffering public had for so long and so regrettably been deprived of the curative action of electricity. Under existing conditions electrical treatment was prescribed by medical practitioners who had no knowledge of the remedy that they were prescribing, and the treatment was administered by those who were entirely ignorant of the nature of the disease which they were treating. The obvious solution was that electro-therapy should be included in the medical curriculum and in the schedules of the various examination boards throughout the country. Dr. Turrell asked: "Ought the suffering public to be deprived, as they are so largely at present, of so powerful a remedy, which strikes directly at the base of the trouble and in many cases produces a cure in a few days of conditions which have resisted for weeks or months the indirect action of drugs, liniments, and ointments?" He said that in the future it would be only the large clinics and hospital departments that could afford to install complete or even adequate equipment, for which whole-time medical men with adequate salaries would be required to order and supervise the treatment, and many technical assistants would be needed. The cost of such treatment would be only one-tenth that administered in private practices and would often be ten times as efficient.

Parliamentary News (BY OUR SPECIAL REPORTER)

IN the House of Commons on July 27th the Postmaster-General told Mr. H. Williams that the number of telephones in Great Britain and Northern Ireland at May 31st, 1936 (the latest date for which the information was available), was 2,613,601. The increase during the previous five years was 605,120.

Empire Broadcasting

Captain P. Macdonald asked the Postmaster-General what was the approximate expenditure to be incurred on Empire broadcasting during the current year; whether any plans for the expansion and development of that service had yet been considered; and what was the approximate expenditure on short-wave broadcasting at the present time by Italy, Germany and Japan.

Major Tryon said that on the first part of the question he was communicating with the British Broadcasting Corporation and would write to Capt. Macdonald. The Government had accepted the recommendation of the Ullswater Committee that the Empire broadcasting service should be developed, and steps were being taken to give effect to this decision. No information was available as to the amounts spent by the countries mentioned on their short-wave broadcasting services.

Electrical Interference

On July 27th Captain Macdonald asked the Postmaster-General if he could now state what action it was proposed to take to implement the report which had just been published with regard to electrical interference with wireless broadcasting in this country.

Major Tryon said that the report was under consideration, but he could not yet say what action would be proposed.

Compensation for Loss of Employment

Mr. Thorne asked the Minister of Transport on July 27th if he could state the amount of compensation that had been paid out under the Electricity (Supply) Acts to workmen, clerks and salaried officers for loss of employment or reduction in wages from the commencement of the Acts.

Captain A. Hudson said that the awards made under the above-mentioned Acts since the passing of the 1919 Act up to March 31st, 1936, amounted to approximately £125,000.

The Number of Electricity Consumers

Capt. Hudson stated on July 27th in reply to a question that the number of consumers of electricity at the end of the year 1929-30 was 3,472,043 and at the end of the year 1934-5, 6,901,000, being an increase of 3,428,957.

Railway Electrification

On July 28th Sir A. Gridley asked the Minister of Transport whether he could say when further railway electrification schemes in the provinces would be decided upon, and in and around Manchester in particular.

Captain A. Hudson said that the responsibility for initiating such schemes rested with the railway companies, and the Minister was unable to anticipate their intentions.

An Electricity Undertaking's Colliers

On July 28th Colonel Ropner asked the Minister of Health whether he was aware that the Brighton Corporation proposed to build two collier ships for the transport of coal for its electricity power station; whether he was aware that such action would undermine confidence among British coastal owners who for years had been maintaining British coastal shipping under great difficulties; and whether he would take steps to discourage the proposal.

Mr. Shakespeare said that the Minister was informed that the Brighton Corporation proposed to purchase two collier ships for the purposes of its electricity undertaking, but that the management of them would be delegated to a firm of shipowners. The Minister was not aware of any grounds for discouraging this proposal.

In the Courts

THE hearing was concluded at the Glamorgan Assizes at Swansea on July 23rd of charges of publishing defamatory libels preferred against Trevor Davies, otherwise Trevor David, an ex-chairman of the Bridgend District Council. He was found not guilty on all eight counts alleged and was discharged. The libels complained of were that he published a poster alleging that Mr. William Welbury, the electrical engineer to the Council, was guilty of bribery and that he was being shielded by a number of councillors. A letter making the same allegation was sent to Mr. Henry P. Williams, the then chairman of the Council.

The defendant pleaded justification, and incidents were given in which he declared that Mr. Welbury had given preferential treatment to contractor friends and had received a gift of a case of wines.

In evidence Mr. Welbury denied any preferential treatment, said that what he did was with the approval of his Council, and regarding the case of wines said that he had paid for it. It was stated that a previous statement of this nature had led to an action for slander in which Mr. Welbury secured judgment for £100 damages and costs.

Injunction Granted to the National Register

In the Chancery Division on July 24th Mr. Justice Eve had before him an application by the National Register of Electrical Installation Contractors for an interlocutory injunction restraining the defendant Mr. Samuel Glass, of Cheetham Hill Road, Manchester, from using on notepaper, invoice headings, or otherwise, the plaintiffs' standard mark or in any manner representing himself as being registered by or in the National Register or as holding a certificate of registration.

Mr. Buckmaster, in support of the application, said that the defendant was no longer on the Register, and, having regard to the rules, on being taken off the Register he should have returned the plaintiffs' device and refrained from putting the initials on his notepaper.

The defendant did not appear, and had written to say that he saw no objection to the injunction being granted. His Lordship granted the injunction accordingly, with costs.

Fraudulent Use of Electricity

At Stoke-on-Trent on July 17th Florence Lily Bulger, of Burslem, was summoned on a charge of fraudulently abstracting electricity. It was stated that an employé of the Stoke-on-Trent Electricity Department went to the defendant's house on June 19th and followed her to the basement where the meter was installed. He saw her snatch something from the meter and later she showed him a piece of cable with a needle at either end. The prosecutor drew attention to the risk which the defendant ran in interfering with the supply.

The chairman of the magistrates also commented on this aspect, and defendant was fined 15s.

Making Electricity Safe

IN the course of his article bearing this title in our issue of June 12th, Mr. H. Marryat referred to the publication by a leading insurance company of a recommendation that installations should be regularly inspected. The author has now sent us a copy of a communication which he has received from Mr. A. S. Trollip, deputy general manager of the Bombay Electric Supply & Tramways Co., Ltd., referring to the article and enclosing some suggestions which he recently sent to the Press. Mr. Trollip puts forward the following eight rules to ensure the safe use of electricity at all times:—

1. *Keep moisture away from electricity.*—Do not handle switches or appliances with wet hands. In the bathroom use insulated switches and enclosed or insulated lighting fittings; do not take portable appliances into the bathroom.
2. *Use flexible cords with care.*—Do not allow cords to kink; circular instead of twin twisted cords for portable appliances will last longer and wear better. Never allow joints to be made in cords. Do not disconnect appliances by pulling on the cord; this loosens the connections and is a frequent source of trouble. Use specially constructed cords for use in damp places and where contact with metal is likely. Do not use a damp cloth for cleaning cords.
3. *Do not use long flexible cords as a substitute for permanent and properly installed wiring.*—Long lengths of cord if run under carpets or rugs become worn too quickly; if run through doorways they may be squeezed and the protective covering damaged. Extra plugs can be installed without upsetting the house and the greater convenience will be worth more than the cost of installation.
4. *Do not leave heating appliances connected when not in use.*—Fire may be caused.
5. *Switch off when cleaning.*—There is a main switch near the meter which turns electricity off completely throughout the house; use it when you are cleaning lamps and fittings.
6. *Do not let children tamper with electrical appliances, cords or plugs.*
7. *Do not use faulty electrical appliances or fittings.*—However small the fault may be, it is better and cheaper to have it attended to immediately. Be sure to have electrical repairs and maintenance done by a licensed electrical contractor.
8. *Monsoon precautions.*—An electrical installation which is safe during dry seasons may develop leakage and the danger of shocks as soon as monsoon conditions begin. Have your installation tested by a licensed electrical contractor at least once a year, at the beginning of the monsoon, to ensure that it is in good condition.

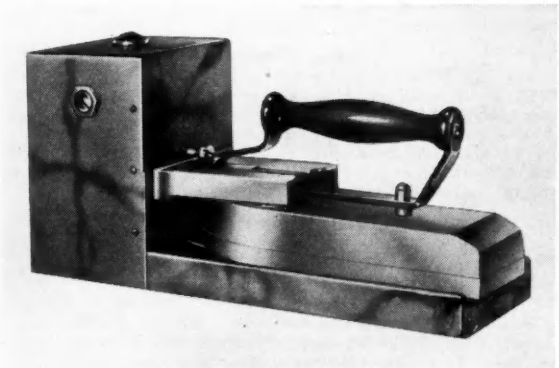
The first six rules are relevant equally to Indian and English conditions. No. 7 is applicable with the substitution of "competent" for "licensed." This amendment is also necessary in Rule No. 8 which, however, applies to severer conditions than those we experience.

New Apparatus and Devices

for Domestic, Cooking and Heating, Lighting, Power and Scientific Purposes

Industrial Irons

A range of irons weighing from 1.75 to 17 lb. and of numerous shapes and loadings for various trades and purposes is made by DOWSING CO. (ELECTRICAL MANUFACTURERS), LTD., Kangley Bridge Road, Lower Sydenham, London, S.E.26. The single heat types are fitted with a cord grip and three-core flex with a rubber protector, while there is a range from 8 lb. upward with three-heat control.



A "Dowsing" industrial iron

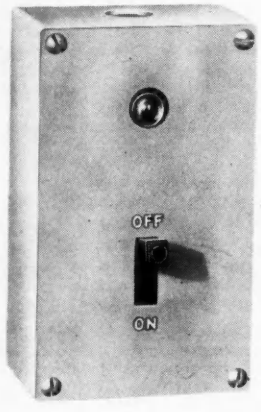
Cordless irons are also made, a recently patented feature being front-entry. By mounting flat contacts on the front of the "lid" of the iron, the necessity for reversing the iron before inserting it in the "shelf" (heating rack) is obviated, and the risk of damaging delicate fabrics is also avoided.

The shelf is of unit construction and can be assembled in any number of banks. The double-pole switch is automatic, being actuated by a lever that is depressed by the weight of the iron when it is inserted, and does not close until the iron is completely inserted. The contacts, which are shrouded, are entirely shielded. A totally enclosed fuse is provided, also a pilot lamp and terminals for earthing both the shelf and the iron itself.

Pilot-light Switches

A line of pilot-light control units fitted with rotary or tumbler switches, in sizes ranging from 5 to 50 A at 250 V, has been introduced by ARROW ELECTRIC SWITCHES, LTD., Hanger Lane, W.5. The switches are fitted into pressed-steel boxes and can be supplied with or without pilot lights or fuses.

These units are available for the control of main water-heaters, wash-boilers and cookers, as well as for use in cinemas, hotels and hospitals where pilot-light indication is advantageous. The pilot lights are of the neon type, using only ¼ W. Their small size enables them to be fitted into compact boxes. Any number of these switch and pilot-light groups may be arranged together under a single plate for flush or surface mounting.



An Arrow pilot-light switch

Air-velocity Measurement

An air-velocity meter known as the "Velometer" that indicates directly velocities in ft. per min. without the necessity of timing or of calculations has recently been developed by AIR-CONDITIONING & ENGINEERING, LTD., 4 to 12, Palmer Street, London, S.W.1.

The instrument is either placed directly in the air stream or in connections to search jets of the air stream. The air passing through the meter actuates a vane to which a pointer is attached, hair control springs, a double-pivoted, double-jewelled movement and a magnetic damping system. The movement is housed in a bakelite case measuring 5¼ in. by 5⅜ in. by 2⅜ in. and weighing 2 lb.

An accuracy is claimed of ±3 per cent. of full-scale reading or higher by the introduction of a correction chart. An externally actuated pointed clamp prevents swinging during transportation and holds the instrument in the reading position when used in poorly lighted situations. A manually operated, zero-adjusting screw permits the return of the pointer to zero if accidentally shifted.

A two-range scale is provided; the lower range, generally 0 to 250 or 0 to 300 ft. per min., is designed to give accurate readings as low as 20 ft. per min. The higher range can be calibrated up to 6,000 ft. per min.

Three models are made, namely, the shutter type, orifice type and tube type. The first is usually employed in warm air-heating service, where air-velocity conditions in rooms or large spaces permit the meter to be held in the air stream while readings are obtained. It is also intended for use in mines. The instrument is self-contained, and to change the reading range only a shutter need be turned.

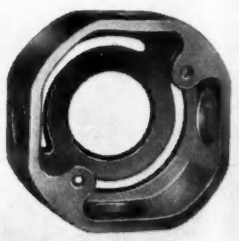
The orifice-type "Velometer" differs from the shutter type in that the case is provided with a threaded and removable orifice fitting which is brought into use when working in the upper range.

In the tube-type instrument the shutter is replaced by a threaded fitting to take the rubber tube and jet for work on the high range.

A Surface Extension Conduit-box

A conduit fitting specially designed to facilitate the extension on the surface of sunk conduit has been introduced by SEAL ELECTRIC, LTD., 17, Edward Street, Westminster, London, S.W.1.

The box is provided with a slotted back to permit of the surface extension tube being placed in any direction, irrespective of the position of the lugs on the sunk box to which it is attached. Knockouts are fitted on all sides to enable further surface extensions to be added subsequently without the existing tubing being dismantled. In addition to the plain lid, an adaptor lid is supplied so that the box can be used with semi-sunk ceiling roses, or any back plate of a fitting having 2 in. centres. The new box is obtainable in malleable or grey iron, and its design preserves complete continuity of the conduit system.



"Seal" surface extension conduit-box

Coil-winding Machines

A range of machines for winding small and medium sized wires, made by Messrs. Micafil, Ltd., in Switzerland, is being introduced to the British market by IMPAG (LONDON), LTD., 10, Lloyd's Avenue, E.C.3.

Type OOFA machine is designed for winding wires of from 0.04 to 0.5 mm. dia. into coils of up to 150 mm. dia. and width. The wire guiding is fully automatic, and the paper feed semi- or fully-automatic, as required. Type OGA is of wider applicability, *viz.*, to wires of from 0.05 to 3.2 mm. dia., and coil dimensions up to 300 mm. dia. and 250 mm. width, again with semi- or fully-automatic paper feed. This machine is intended especially for winding the primary coils of potential transformers.

For winding honeycomb and cross coils, type HOM is available; this can be fitted with an attachment to permit the use of enamelled wire.

The armature winding machines, type AWO for two pole armatures up to 60 mm. dia. and type AWI for two-, four-, and six-pole rotors up to 160 mm. diameter, are readily changed from one type to another. Also, they are adaptable to parallel or skew slots, permit the winding of two wires in parallel, and are designed with a view to avoiding damage to the insulation, however confined the winding space.

Four standard types of unwinders are supplied, in one of which (type DA, universal) the stock coil is driven so that the wire can be taken off unstressed and free from twist. The applications of these machines include the winding of coils for telephone and radio apparatus, electric clocks, small motors, and similar equipment.

A Midget Battery

A "high-voltage" dry battery (52.5 V) with a new type of connector (developed by RADIO-AID, LTD., 45, Duke Street, London, W.1) has proved to be very useful for amplifiers for the deaf where space and weight considerations are important. The disadvantage of exposed strip connectors, which are the usual alternative to sockets for plugs, is avoided by bending the two brass strips flat across the sealing compound at the top of the cells. Messrs. Siemens Electric Lamps & Supplies, Ltd., have obtained a licence to make these batteries for radio purposes, more particularly midget sets. The overall dimensions are 1.75 in. by 3 in. by 4 in.

Electrical Revival in Canada

By Our Canadian Correspondent

FOR a long time now, until fairly recently, there has been little activity in electrical matters in Canada and therefore little of interest to write about, but lately there seems to have been slow but steady improvement. Gradually, contracts are being let for new transmission lines, extensions to distribution systems, transformer stations, &c. Electrical manufacturing firms are busier and wiremen and electrical inspectors are getting more work, although none of it is spectacular as to capacity or extent.

Electricity supply authorities are beginning to experience increasing outputs, and their reports show growing revenues. All these things mean some reduction in unemployment and a better circulation of money. For those who still have no work, and there are very many of them, the movement is no doubt all too slow, yet it is perhaps all the more sure.

The much-disputed "Hydro" contracts between certain privately owned electricity supply companies in Quebec and the Hydro-Electric Power Commission of Ontario were finally cancelled a short time ago and new short-term (ten years instead of forty years) contracts have been made, with several of the companies, at substantially lower rates. As the cancellation of the contracts was handled by the Government of Ontario, its political opponents criticise the action very severely, but the columns of a technical paper of another country are not the place in which to discuss the pros and cons of a political controversy, no matter what the arguments be on either side.

The industry that seems to be forging ahead most rapidly in Canada is that of mining, and this is of particular interest from an electrical standpoint on account of the large amount of hydro-electric power that is being used, and will be used in the near future, in Northern Ontario especially. The generating plants under the control of the Hydro-Electric Power Commission are benefiting from this activity on account of increased sales of power and new contracts.

Load-building Activities

A few months ago a "Hydro" load-building committee was formed, and several sub-committees have been created to take up load-building in lighting, electric ranges, industrial and commercial applications, as well as to deal with sales and advertising, wiring, rural work, &c.

There is a great deal of activity all over the United States and Canada in the "Better Light, Better Sight" campaign, and the Commission is doing its share in Ontario, one particular field of work being the schools, in which, in many cases, the lighting is very far from good. It is said that only 5 per cent. of Ontario's schools are adequately lighted.

A notable movement in the province of Quebec has been the creation by the Government of the Quebec Electricity Commission with very wide powers. The members are: Chairman, Dr. A. Frigan, M.E.I.C.,* Director of Technical Education of the Province; vice-chairman, Dr. O. O. Lefebvre, M.E.I.C., Chief Engineer, Quebec Streams Commission; and Mr. J. W. McCammon, A.M.E.I.C., consulting engineer, Montreal. These men are all engineers of standing and experience, and, as their appointment is a departure from the usual practice of appointing men noted for their achievements in business, finance, or in law, it will be interesting to watch how engineers carry out the duties of such a Commission—one does not anticipate failure on their part, and it may be possible for them to show that a group of good engineers can handle problems which are very largely of an engineering nature in a perfectly satisfactory manner, although the civilised world as a whole does not appear to be willing to admit that this is so.

The Commission is said to be independent of the Government and of political influence. Its members are to devote all their time to the work, which will embrace a wide range of activities; it includes the approval of construction and operation of any new line or plant or extensions or alterations thereto; the supervision of rate schedules and a number of other matters.

A Tidal Power Scheme

A few years ago there was talk of a scheme for utilising the power available from the tides in Passamaquoddy Bay (now "Quoddy" for short), the shores of which are in New Brunswick and the State of Maine. At first it was to be a joint Canadian and United States project, but later the latter country chose to go ahead alone, of course, wholly in U.S. territory. Now, after appropriating and expending $10,000,000 on the first part of the work, the U.S. Government is faced with the necessity of either supplying additional funds or abandoning the scheme altogether.

In Manitoba, the Manitoba Power Commission proposes to spend some $200,000 on various electrical works—extension of transmission lines and the construction of distribution systems for some of the municipalities. The city of Winnipeg is considering buying the properties of the Winnipeg Electric Co. The municipal undertaking, the Winnipeg Hydro-Electric System, has been run very successfully for years.

In British Columbia, the B.C. Electric Railway Co. is reported to be preparing to spend about $1,000,000 on improvements to the electric power supply in Vancouver. According to *Electrical News and Engineering*, it is understood that the West Kootenay Power and Light Company is to go ahead with a 200,000-h.p. development on the Pend Oreille river. The company is evidently expecting growth in industrial activity.

*The E.I.C. is the "Engineering Institute of Canada."

Electricity Supply in Ontario

THE Hydro-Electric Power Commission of Ontario, which was set up in 1906, has been operating since 1910 and the twenty-eighth annual report contains a number of diagrams depicting the growth of the system. At the end of 1935 the Commission was supplying electricity in bulk at cost price to 766 municipalities and 171 rural power districts in Ontario, these bodies serving their retail consumers at cost price also. It also supplied certain large industrial consumers. The total output to its four systems and the Northern Ontario properties last year was 6,919 million kWh (4,561 million kWh was generated and 2,358 million kWh was purchased), an increase of 7.8 per cent. on the previous year and 35 per cent. on 1930, the highest pre-depression year. The aggregate peak load was 1,300,000 kW.

Generating plant installed had a maximum normal capacity of 1,011,000 kW, of which 750,000 kW was in the Niagara undertaking. Maintaining the clearance of 2,800 miles of transmission and distribution lines from the 51,000 trees on the route cost $45,000, about $0.88 per tree. Approximately the same cost per tree was incurred for similar work carried out for the municipalities, involving seventy miles of distribution line and over 4,000 trees. The three 220-kV lines in the Niagara system operated without trouble, apart from nine single-circuit failures, eight of which were due to lightning. The Leeside 220/110/13.2-kV transformer station also gave a satisfactory performance. In Eastern Ontario 148 million kWh (off-peak) was supplied to the steam generator at the Howard Smith paper mills.

The settled area to the south of the Province of Ontario occupies 40,000 sq. miles of the total of 400,000 sq. miles. Three-quarters of this settled area consists of land cleared for agriculture with a population of 1,100,000 and containing within reach of existing lines about 65,000 farms, half of which are connected. In the 171,000 rural power districts are 68,000 consumers served by primary networks of 10,000 miles. The free supply of energy to washing machines, pumps and a.c. radio sets started in 1934 for rural consumers was continued.

In all rural districts the highest rate for domestic consumption has (when higher) been reduced to 6 cents per kWh. The second rate is 2 cents per kWh, with a third rate of 0.75 cents.

Assistance is given to farmers and other residents by a grant-in-aid amounting to fifty per cent. of the cost of service line and equipment, by fixing a maximum service charge and by monetary advances for wiring motors and other apparatus. Native cedar poles are generally used for carrying rural transmission lines. New combinations of copper and steel and aluminium and steel are being tried with a view to increasing conductor strength with longer spans.

Important features of the Commission's work are the testing and research laboratories, the approvals laboratory and the electrical inspection division. Among the duties of the first are the acquisition of information leading to economy in construction work, reduction in maintenance costs and the securing of power and other loads, which now includes a study of the possibilities of soil heating by electricity. Electrical appliances sold in Ontario must be tested in the approvals laboratory with a view to eliminating dangerous equipment.

Administration of the Commission's rules governing electrical installations falls to the electrical inspection division. It is stated that fourteen fires were caused by electrical defects in 1935 as against twenty-three in 1934. In the majority of fires, however, the evidence of origin is destroyed. Four of the fires were due to defects in armoured cable and five in extension cords.

Six persons were killed by shock (three in 1934); in two cases the voltage was 115, in one case 550, and the remainder were at high voltage. Assets of the Commission have an aggregate value of $333 million. Operating expenses amounted to $20.7 million. Operating revenues came to $31.9 million and other income to $2.5 million. After deducting interest and sinking fund charges from the gross income of $13.7 million, there was a net deficiency of $3.3 million.

Business and Industrial Notes

The Week's News. Showrooms and Exhibitions. New Installations. Overseas Trade. Publicity Material. Trade Announcements. Prices of Materials. Liquidations and Bankruptcies.

The " Electrical Review " Index

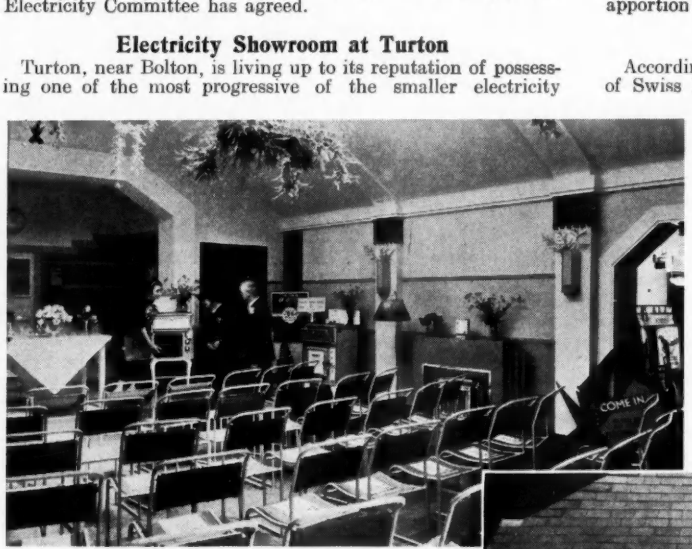
The index to Vol. CXVIII of the ELECTRICAL REVIEW (January-June, 1936) is now available. Any reader who requires a copy may obtain one gratis from the Publisher, ELECTRICAL REVIEW, Dorset House, Stamford Street, S.E.1. Cloth binding cases may also be obtained at the price of 3s. 6d. each (4s. post free).

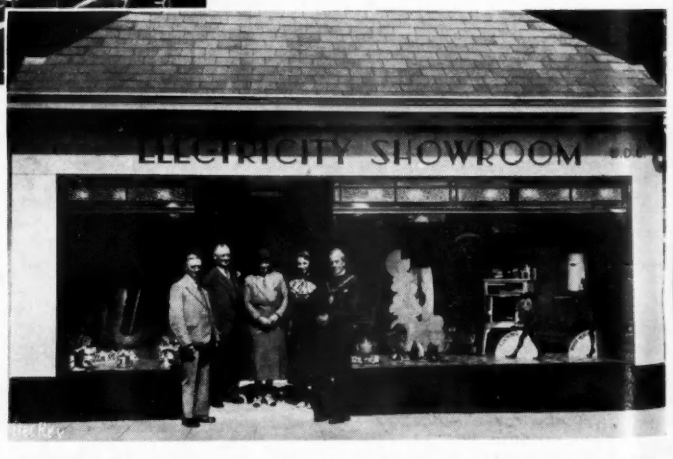
Municipal Trading at Cheltenham

In connection with the showroom schemes the Cheltenham borough electrical engineer has reported that it is desirable to have an organised body to make arrangements for their execution and that the local Electrical Development Association Circle, which has been in existence for some years, is the only appropriate body for this purpose. He has therefore suggested that all the arrangements with the contractors for the showroom should be made through this body, and the Corporation Electricity Committee has agreed.

Electricity Showroom at Turton

Turton, near Bolton, is living up to its reputation of possessing one of the most progressive of the smaller electricity undertakings in Lancashire, and on July 22nd a new electricity showroom erected by the Urban District Council was formally opened by Mrs. E. C. Deakin, wife of a large landowner in the district. The plans for the new erection were prepared by Mr. R. Dart, the Council's engineer and surveyor, and Mr. C. A. Coleman, the manager of the electricity undertaking, was responsible for the installation of all the devices and fittings. Incidentally, Mr. Coleman has completed nineteen years with the department, and during that period the number of consumers has grown from 68 to 2,050. Mr. G. W. Isherwood, chairman of the Electricity Committee, said that with the satisfactory development of the undertaking it was decided to cater for the housewives and other consumers by providing a showroom and new stores.





Councillor G. W. Isherwood, the chairman of the Electricity Committee, and Mrs. Isherwood, being shown one of the latest cookers in the demonstration room at new electricity showrooms at Turton. Above: Mr. C. A. Coleman (manager), Councillor Isherwood, Mrs. E. C. Deakin, Miss Pitts (demonstrator) and the Rev. J. O. Platt (chairman of the U.D.C.) outside the new premises

Wages in the Cable-making Industry

The Joint Industrial Council for the Cable-making Industry announces that a rise in the cost of living to 46 per cent. above the 1914 level will involve an increase in wages in the industry on the third pay-day in August. The new scale of weekly wages is as follows:—Male time workers: District No. 1 ranging from 52s. 10½d. in class 1 to 60s. 8½d. in class 5; district No. 2, ranging from 47s. 6d. in class 1 to 55s. 6d. in class 5. Youths and boys (14-20): District No. 1 from 13s. 8½d. to 43s. 1d.; district No. 2, from 13s. to 39s. 6d. Women (18 and over): From 26s. 6d. to 30s. 6d. Girls (14-17): From 13s. to 17s. 6d.

Duty on Hand Lamps

On the recommendation of the Import Duties Advisory Committee the Treasury has issued the Additional Import Duties (No. 18) Order, 1936, which imposes a duty on lamps or torches operated by a dry battery and cases therefor at a rate of 1s. 2d. per lb. (as an alternative to the present duty of 20 per cent. *ad valorem*) in the case of hand lamps, pocket lamps, hand torches and inspection lamps (excluding miners' lamps) and of 6d. each (as an alternative to 33⅓ per cent. *ad valorem*) in the case of lamps adapted for use on cycles. The Order takes effect from July 27th. In its report the Committee says that there has been a remarkable increase since 1932 in the imports of cheap lamps of the types described, which have been sold to wholesalers at prices considerably below the costs of production of similar articles in this country. Hand torches of cylindrical shape form the bulk of the trade. These are commonly sold retail, complete with battery and bulb, at the same prices as British torches, and the Committee sees no reason to suppose that hardship will be inflicted on the consumer if the British manufacturers are enabled by the duty to take a larger share of the trade.

Compensation for Displaced Employés

The Central Electricity Board has allowed £10,000 compensation to twenty-six men who have either been dismissed or have suffered reductions in salary following the closing of the Manors power station consequent upon Newcastle City Council taking its electricity supply from the grid. Sir Harold Morris has been appointed by the Ministry of Labour to apportion the money.

Swiss Electrical Manufacture

According to the recently issued report of the Association of Swiss Machinery Manufacturers for 1935, their electrical section experienced an increased demand for generating plant and transformers as a result of an improvement in economic conditions in a number of foreign countries and greater investment activity in various European states. In the home market, however, a decline in orders as a whole was recorded. Dealing with individual lines of electrical manufacture, the report states that while sales of meters in Switzerland itself showed no change, export trade suffered from price cutting, in spite of the generally brisker demand. Shops turning out switches and switchgear had a satisfactory amount of work on their books, but those making telephone apparatus suffered from a decline in sales. Makers of electric heating apparatus found some difficulty in competing in foreign markets on account of relatively high prices. Lighting installation material and fittings were in declining demand on account of the comparative inactivity in building. In the cable and insulated wire section of the industry short time was necessitated, while makers of electrical measuring instruments and scientific apparatus found it difficult to keep their staff fully employed because of price-cutting.

Scottish Electricians' Wages

It was reported in a daily paper last week that Scottish electricians were holding a ballot upon strike action as "the result of delay by the E.C.A. in negotiating with the union officials." We asked Mr. W. Finlay, W.S., the Secretary of the E.C.A. of Scotland, for a statement on the subject and he says that during the past few months the Association has been negotiating with the Electrical Trades Union regarding wages and various other problems such as the position of improvers or young journeymen, working rules, and the enforcement of standard wages throughout the industry. After a recent conference with the E.T.U. the Board of the Association informed the Union of its views on the various points discussed, stating

inter alia that if standard wages were to be enforced it would embarrass proceedings if at the same time there was a rise in wages. Proposals were also made on the other points under discussion and a reply from the Union is still awaited. While the Union may be taking a ballot of its members as to the advisability of strike action, that is a question of internal administration. By the joint rules signed in 1934 provision is made for certain notices being given and negotiations taking place before either side proceeds to strike or lock-out. Mr. Finlay wrote to the E.T.U. pointing out the incorrectness of the report mentioned above and the Union has stated that it was not responsible for it.

The Empire Exhibition, Johannesburg

Three oil engines made by Messrs. Ruston and Hornsby, Ltd., will be shown on the stand of Messrs. Hubert Davies & Co., Ltd., at the forthcoming Empire Exhibition, which is being held in Johannesburg. The Ruston range which these engines represent extends from 5 to 1,570 b.h.p.

Representative examples of the English Electric Co.'s products will include switchgear, fusegear, industrial motors and control gear, fractional h.p. motors, house service meters, welding equipment, neon sign transformers and domestic electrical appliances. There will also be specimens of the latest types of coach seating for trams, trolley-buses, &c., two special pedestal stands will accommodate photographs illustrating a comprehensive range of manufactures and typical examples of installations carried out by the company in South Africa and elsewhere.

The cable accessories' section of the British Insulated Cables' exhibit will include street pillars, network boxes for underground mains, terminal boxes, cut-outs and electricity meters: the "selective" and "detachable pocket" types of network box are particularly interesting. Welders, rivet heaters and static condensers will also be represented and other items will be insulators and fittings for overhead line work (both power and traction), copper earth rods and primary batteries.

Annual Holidays

The offices and works of Messrs. Corfield-Sigg, Ltd., will be closed from Friday evening, July 31st, to Monday morning, August 10th.

Aidas Electric, Ltd., is closing its works from mid-day on Saturday, August 1st, until Monday morning, August 10th.

The Trafford Park and Willesden Works (but not the offices) of the Lancashire Dynamo & Crypto, Ltd., will be closed from this evening, July 31st, to Monday, August 10th.

Social Event

There was an attendance of about 3,000 at the sixth annual sports of Messrs. C. A. Parsons & Co., Ltd., and Sir Howard Grubb Parsons & Co., which were held at Wallsend on Saturday. Mr. A. Crocker, works manager, presided at the prize-giving ceremony and referred to the work in hand which would keep them busy for two years. The prizes were presented by Mrs. Bedford, wife of Mr. F. G. H. Bedford, managing director of Messrs. Parsons & Co. A silver cup given by Mr. Bedford for the competitor gaining the most points was won by R. Duncan. A dance was held at the Grand Assembly Rooms, Newcastle, in the evening.

New Zealand's Electrical Imports

The *Board of Trade Journal* states that for the March quarter imports of electrical apparatus into New Zealand amounted in value to £(N.Z.)355,500, of which the United Kingdom was responsible for £233,579, Canada £33,850, Australia £30,075, the United States £38,561 and Japan £3,211. Telephone and radio apparatus imports were valued at £92,647—£29,483 from the United Kingdom, £2,130 from Canada, £17,535 from Australia and £41,985 from the U.S.A.

Electricity Supply Rifle League

At the conclusion of the first half of the season the leaders of the various divisions of the Electricity Supply Rifle League

A telling refrigerator display in the Whitchurch showroom window of the Electricity Distribution of North Wales and District, Ltd.

are as follows:—City "A," Division 1; City "C," Division 2; Clesco (S.E.), Division 3; Barking "B," Division 4.

Fire at Switchgear Works

In connection with a paragraph which appeared in the Press to the effect that "the factory of Messrs. J. G. Statter & Co., Ltd., electrical engineers, of Little Chalfont, was destroyed by fire last Friday," the company informs us that the building destroyed was the recreation building for the staff and employés. The damage done to the factory itself was slight and will not seriously interfere with deliveries.

For Sale

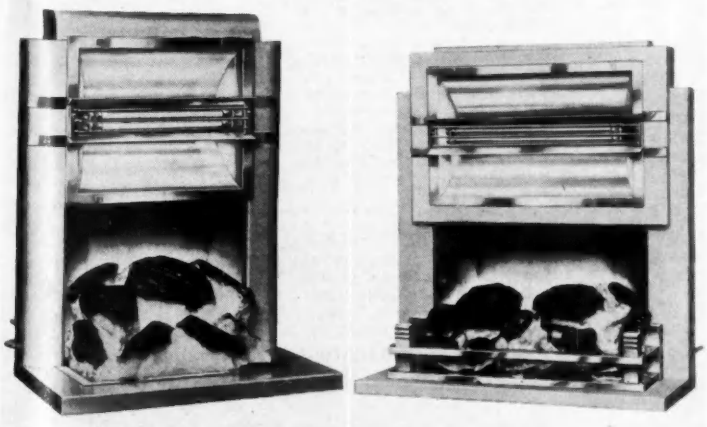
Hull Electricity Department has for disposal two storage batteries, with booster, regulating switches, cables, copper rod connections, &c. (See our classified advertisements.)

Electrical Workers' Strike at Shipyard

Because of the employment of a non-union man on a submarine nearly a hundred electrical workers took part in a

New Season's Ferranti Fires

SEVEN new fires and many improvements to existing models are announced in Messrs. Ferranti's 1936-37 season's programme. The outstanding development is the use of a new type of reflector made of "Solium" on all fires finished in oxy-copper. This material, besides matching the copper and giving a much warmer appearance even when the fire is switched off, is claimed to have the additional advantage of possessing an 8 per cent. higher efficiency in radiant heat yield than chromium.



Two of the new Ferranti "Flamera" fires, models 640 and 652

These reflectors are employed very effectively in the five new "Flamera" models, which, by the use of easily interchangeable elements, are available in various loadings from 1 to 2½ kW. The flame effect is particularly realistic, and considerable improvements have been made to the imitation fuel (Ferranti patent) which is removable for lamp replacement by simply undoing a pair of tags. Entry of the flexible at the side permits an absolutely flat back, and the fixing of a deflector plate just above the reflector will avoid discoloration of walls due to burnt dust particles. The grates are of the well type and the choice of designs should cater for all tastes. Oxy-silver finish with chromium reflector is available if desired.

In addition to the 1,250-W "Novera" tubular fire, which has been improved, two further models with adjustable reflectors are being introduced having loadings of 1 and 2½ kW. The loading of the "Modera" fire has been increased from 750 to 1,000 W, while the prices of the 750-1,500-W "Glowera" models are to be lower. No substantial alterations will be made in the panel and "Primera" ranges.

Wall fires are available in four types, the loading of "Model 2781" being increased from 750 to 1,000 W and the price reduced. The 750-W fires are obtainable in either white enamel or aluminium finishes at no extra charge.

The guards of all fires have been altered and improved, and the flex provided tones with the various finishes.

lightning strike last week-end at Messrs. Cammell, Laird & Co.'s shipyard at Birkenhead. The men agreed to return to work on Wednesday.

The Warwickshire County Show

The City of Birmingham Electric Supply Department had a very effective stand at the Warwickshire Agricultural Society's Annual Show held at Solihull on July 17th and 18th. The display was devoted primarily to electrical appliances for use on the farm, and included a steriliser, a skid motor for cutting chaff, and other power apparatus, a steam raiser, a chicken hover, a frame fitted with soil-heating cable, and a greenhouse equipped with tubular heaters. A selection of domestic appliances was also shown.

Electrical Contracts at Stoke-on-Trent

As from January 1st next contracts for electrical work and orders issued by the Stoke-on-Trent Electricity Committee are to be given only to members of the National Federated Electrical Association or to contractors on the National Register of Electrical Contractors.

Trade Announcements

The manufacture of "Mercon" sign flashers and programme controllers formerly made by Mercon Electric Controls, is now carried out by Klaxon, Ltd. The range includes motor-driven mercury switch sign flashers having any number of ways and suitable for any sequence of timing of the various ways; switches for either 5 or 16 A per way can be fitted. In addition to the animation of electric signs there are also many industrial applications such as automatic signalling in a predetermined code, timing of industrial processes, control of animated display models, &c., and any special timing cycles for special applications can be provided.

The Fuller Accumulator Co. (1926), Ltd., is opening a new depôt to-morrow (Saturday) in Robertson Lane, off Robertson Street, Glasgow.

Prices of Materials

The following prices are only general, and they may vary according to quantities and other circumstances:—

CHEMICALS, ETC.	Price. July 29th.	Fortnight's Inc. or Dec.
a Acid, Oxalic ... ... per cwt.	50s.	—
a Ammoniac, Sal ... ... per ton	£36	—
a Ammonia, Muriate (large crystal) ... ,,	£18 10s.	—
a Borax ... ... ,,	£17	—
a Copper, Sulphate ... ... ,,	£15 10s.	—
a Potash, Chlorate ... ... per lb.	3¾d. to 4¼d.	—
a ,, Perchlorate ... ... ,,	6d.	—
a Shellac ... ... per cwt.	£4 18s.	—
a Sulphur Commercial ... ... per ton	£11	—
a ,, Roll ... ... ,,	£11	—
a Soda Chlorate ... ... per lb.	3¼d. to 3¾d.	—
a ,, Crystals ... ... per ton	£5 to £5 5s.	—
a Sodium Bichromate, casks ... ... per lb.	4d. nett.	—
METALS, ETC.		
b Aluminium, Ingots ... ... per ton	£100 to £105	—
b ,, Wire ... ... per lb.	1/1 to 1/9	—
b ,, Sheet and Foil ... ... ,,	1/3 to 2/9	—
p Babbitts Metal and Anti-friction Metals—		
Grade I ... ... per ton net	£175	£1 dec.
Grade II ... ... ,,	£122	—
Grade III ... ... ,,	£67	£1 inc.
c Brass (rolled metal 2" to 12" basis) per lb.	7¾d.	¼d. inc.
c ,, Tubes (solid drawn) ... ... ,,	9¾d. to 10d.	—
c ,, Wire, basis ... ... ,,	7¾d.	¼d. inc.
c Copper Tubes (solid-drawn)... ... ,,	10¾d.	¼d. inc.
g ,, Bars (best selected)... ... per ton	£70	£2 inc.
g ,, Sheet... ... ... ,,		
g ,, Rod ... ... ,,		
d ,, (Electrolytic) Bars ... ... ,,	£42 5s.	17s. 6d. inc.
d ,, ,, Wire Rods ... ,,	£47 15s.	17s. 6d. inc.
d ,, ,, H.C. Wire ... per lb.	7¾d.	¼d. dec.
f Ebonite Rod ... ... ,,	1/6 to 2/- plus	—
f ,, Sheet ... ... ,,	1/3 to 1/6 10%	—
n German Silver Wire ... ... ,,	2/5	—
h Gutta-percha, fine ... ... ,,	nom.	—
h India-rubber, Para-fine ... ... ,,	10¼d.	¼d. inc.
i Iron, Pig (Cleveland, No. 3) ... per ton	67/6	—
i ,, Wire galv. No. 1, P.O. Qual.... ,,	£20	—
g Lead, English Pig ... ... ,,	£18 10s.	£1 inc.
g Mercury ... ... per bot.	£11/9/6 to £11/19/6	3s. dec.
Mica (in original cases) small ... per lb.	9d. to 1/6	—
,, ,, ,, medium ... ,,	5/- to 10/-	—
,, ,, ,, large ... ,,	10/6 to 17/6 up	—
p Phosphor Bronze, plain castings ... ,,	1/1	—
p ,, ,, drawn bars & rods ,,	11¾d.	—
p ,, ,, rolled strip & sheet ,,	11¼d.	—
p ,, ,, wire ... ... ,,	1/0¾d.	¼d. inc.
o Platinum ... ... per oz.	£8	—
d Silicium Bronze Wire ... ... per lb.	8½d.	1/16d. inc.
g Spelter... ... ... per ton	£14	12s. 6d. inc.
r Steel, Magnet, in bars ... ... per lb.	7¼d.	—
g Tin, Block (English) ... ... per ton	£179 10s.	£13 dec.
n ,, Wire, Nos. 1 to 16 ... ... per lb.	3/8	—

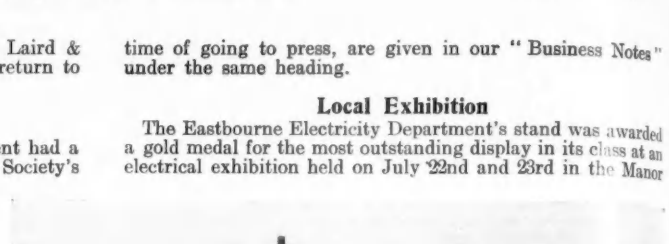
Quotations supplied by:—

a G. Boor & Co.
b The British Aluminium Co., Ltd.
c Thos. Bolton & Sons, Ltd.
d Frederick Smith & Co.
e F. Wiggins & Sons.
f India Rubber, Gutta Percha and Telegraph Works Co., Ltd.
g Henry Gardner & Co., Ltd.
h Edward Till & Co.
i Bolling & Lowe.
n P. Ormiston & Sons.
o Johnson Matthey & Co.
p C. Clifford & Sons, Ltd.
r W. F. Dennis & Co.

The above table is published here fortnightly. In alternate issues, in which it does not appear, the latest prices of copper, silicium bronze wire, lead, rubber, tin and spelter, up to the time of going to press, are given in our "Business Notes" under the same heading.

Local Exhibition

The Eastbourne Electricity Department's stand was awarded a gold medal for the most outstanding display in its class at an electrical exhibition held on July 22nd and 23rd in the Manor Gardens in conjunction with the Eastbourne Flower Show. The display was planned in a garden setting, complete with illuminated fountain and rock pool, and demonstrations of cooking, water heating, washing and refrigeration were given, together with indications of the uses of electricity as applied to agriculture.



The City of Birmingham Electric Supply Department's stand at the Warwickshire County Show

Swiss Electrical Exports

Exports of electrical manufactures from Switzerland decreased in 1935 as compared with the previous year. Only dynamo-electric machines and apparatus not specifically mentioned (weighing from 3 to 50 kg.) appreciably increased in value. There was a substantial falling-off in the exports of measuring instruments and of radio telegraphic apparatus. The imports of electrical plant also decreased largely, except telephone and telegraph apparatus.

Gaumont-British to Sell Television Sets

A New York correspondent of the *News-Chronicle* states that Mr. Isidore Ostrer announced recently that Gaumont-British are to sell television receiving sets to the English public when television broadcasting starts in October.

New Catalogues and Lists

Ferranti, Ltd., Radio Works, Moston, Manchester, 10.—Valve catalogue, R.115, giving the latest B.V.A. prices.

British Thomson-Houston Co., Ltd., Crown House, Aldwych, London, W.C.2.—An illustrated catalogue of "Mazda" light tubes for architectural, decorative display and sign lighting.

L. G. Hawkins & Co., Ltd., 30/35, Drury Lane, London, W.C.2.—A number of leaflets dealing with fires, clocks, the "Tecal," the "Culinaire," coffee maker, vacuum-cleaners, wash-boilers, lighting fittings and small appliances.

Marconi's Wireless Telegraph Co., Ltd., Electra House, Victoria Embankment, London, W.C.2.—New technical booklets dealing with short-wave telegraph-telephone receivers, telephone terminal and privacy equipments and radio apparatus for aircraft and aerodromes.

General Electric Co., Ltd., Magnet House, Kingsway, London, W.C.2.—A folder dealing with electrical equipment for farms, dairies, &c.

S. Bill & Co., Ltd., Queen's Road, Aston, Birmingham, 6.—Details of improved "Insulok" all-insulated switch-fuses and splitters.

Ateliers de Constructions Electrique de Charleroi, 56, Victoria Street, London, S.W.1.—A stock list for July.

British Insulated Cables, Ltd., Prescot.—A catalogue of "Rampend" fittings for trolley-bus and rail traction.

Milne & Longbottom, Elm Works, Mere Lane, Rochdale.—Booklet dealing with "Elm" circuit-breakers, contactors, and switchgear, &c.

Wild-Barfield Electric Furnaces, Ltd., Elecfurn Works, North Road, Holloway, London, N.7.—A brochure describing "Heavy-Hairpin" and "Tubular Hairpin" furnaces.

Fitz-Gibbon & Murray, Ltd., 13, Greek Street, Soho Square, London, W.1.—A list of small "Jeani" electrical accessories.

Dowsing Co. (Electrical Manufacturers), Ltd., Kangley Bridge Road, Lower Sydenham, London, S.E.26.—A leaflet dealing with domestic and light industrial appliances.

Bankruptcy Proceedings

J. C. Parnell, wireless dealer, 82, Langdale Road, Hove, Sussex, lately carrying on business as the Ventnor Wireless Co., 150, High Street, Ventnor, Isle of Wight.—This debtor attended at the Town Hall, Newport, Isle of Wight, recently for his public examination. His statement of affairs showed liabilities of £499, with estimated assets of £41, leaving a deficiency of £458. Debtor attributed his failure to lack of experience, bad trade, depreciation of stock and bad debts. The examination was adjourned to the Brighton Court, and the Registrar said that upon debtor signing the notes there, the examination would be closed.

Lloyd Electric Lamp Co., 8, Rangoon Street, and late of 4, Lloyds Avenue, E.C.—This firm failed last March, and on July 24th J. Sunshine, a partner in the business, applied to Mr. Registrar Parton at the London Bankruptcy Court for an order of discharge. The Official Receiver reported that the ranking liabilities were returned at £1,349 and the estate had realised £241, which, however, was entirely absorbed by the preferential claims and costs of the bankruptcy. The applicant became a partner in the firm in August, 1934, and the failure was attributed to lack of capital; to trading on too narrow a margin of profit; and to a promised capital of between £1,000 and £2,000 not being forthcoming. The discharge was suspended for nine months.

L. G. Bailey, radio dealer, trading as L. G. Bailey & Co., 1, Port Soderick Street, Salford, Lancs.—At the public examination held recently at the Court House, Encombe Place, Salford, the statement of affairs disclosed liabilities of £594, with assets estimated to realise £56, leaving a deficiency of £538. The debtor attributed his failure to the recent fall in the price of radio sets. The examination was adjourned for closing.

W. C. Hanson, radio engineer, 78, Priory Road, Kenilworth, Warwickshire, lately carrying on business as "Kenilworth Radio Supplies," 37, Warwick Road, Kenilworth. The public examination herein was concluded at the Shire Hall, Warwick, recently. Debtor had returned a deficiency of £605. The examination was closed.

F. E. V. Hooper, electrical engineer, 26, Moorgate Avenue, Crookesmoor, Sheffield, carrying on business as "Hooper's Service Station," Walkley Road.—Last day for receiving proofs for dividends August 10th. Trustee, Mr. L. J. Clegg, 14, Figtree Lane, Sheffield, Official Receiver.

C. W. Prosser, electrial engineer, trading as "Prosser Bros.," 81, Woodside Street, Cinderford, Glos.—First meeting August 5th at the County Court Offices, Commercial Road, Gloucester. Public examination September 17th at the Shire Hall, Gloucester.

H. Holliday, electrician, 4, Highfield Place, Morley, Yorks.—Receiving order made July 23rd on debtor's own petition. First meeting August 5th at the Official Receiver's Office, Hallfield Chambers, 71, Manningham Lane, Bradford. Public examination October 1st at the County Court, Eightlands, Dewsbury.

J. Davies, wireless engineer and dealer, 6, Howe Terrace, Crook.—Receiving order made July 22nd on debtor's own petition. First meeting August 6th at the Official Receiver's Offices, 32, Frederick Street, Sunderland. Public examination August 11th at the County Court, Old Elvet, Durham.

R. H. Hermann, wireless dealer and engineer, "Kinnoull," Havant Road, East Cosham, Hants.—Receiving order made July 23rd on debtor's own petition.

J. Cooper, electrical engineer, trading as J. Cooper & Son, 30, Warner Street, Haslingden.—Trustee, Mr. P. M. Milward, Byrom Street, Manchester, Official Receiver, released July 16th.

D. W. J. Prentice, electrical engineer, 59, Brecon Road, Fulham, S.W.—This debtor attended on July 28th before Mr. Registrar Parton at the London Bankruptcy Court for public examination upon accounts showing liabilities of £832 against assets of £59. He attributed his present position to his having accepted contracts at too small a margin of profit, to heavy trade expenses, and to lack of trade. The examination was concluded.

C. R. G. Webb, electrical engineer, trading as "The Southern Electrical Mechanical Co.," 146a, Eastern Road, Brighton.—Receiving order made July 21st on a creditor's petition. First meeting August 6th at the Official Receiver's Office, 8, Old Steine, Brighton. Public examination October 14th at the Court House, Brighton.

A. D. M. Mayer, electrical engineer and wireless specialist, 75, Pasture Road, Goole, Yorks.—Trustee, Mr. F. E. Bendall, 27, York Street, Sheffield, released June 11th.

C. S. Berridge, electrical contractor, 83, St. John's Street, Bridlington.—Receiving order made July 21st on debtor's own petition. First meeting August 5th at the Official Receiver's Office, Bank Chambers, Scarborough. Public examination September 15th at the Court House, Scarborough.

Company Liquidations

Geo. Becker, Ltd.—Winding up voluntarily for reconstruction. Particulars of claims to the liquidators, Mrs. S. M. Becker, 29, Forty Lane, Wembley Park, and Mr. E. Symons, 1, Endsleigh Street, Tavistock Square, London, by August 8th. Meeting August 25th at Ampere Works, Wembley, to receive an account of the winding up by the liquidators.

Ship Carbon Company of Great Britain, Ltd.—Meeting August 31st at 55-61, Moorgate, London, E.C.2, to receive an account of the winding up by the liquidator, Mr. G. H. Robinson.

United Ebonite Manufacturers, Ltd.—Meeting August 31st at 55-61, Moorgate, London, E.C.2, to receive an account of the winding up by the liquidator, Mr. G. H. Robinson.

Barton-on-Humber Electric Supply Co., Ltd.—Winding up voluntarily. Liquidator, Mr. J. J. H. Stansfield, 36, Park Place, Leeds.

Neon Erectors, Ltd.—Particulars of claims to the liquidator, Mr. A. Yearsley, 27, Brazennose Street, Manchester, by August 25th. Meeting September 8th at the above address to receive an account of the winding up by the liquidator.

Bayton Electrical Co., Ltd.—Winding up voluntarily. Liquidator, Mr. H. Fisher, 23, Brazennose Street, Manchester.

Dissolutions of Partnership

Messrs. A. S. Jackson and S. A. Jagger, electrical contractors, 303a, Birchfield Road, Perry Barr, Birmingham, trading as "The Wellington Electrical," have dissolved partnership. Mr. Jackson will continue the business at the above address under the title of "The Wellington Radio & Electrical," while Mr. Jagger will carry on business at 5, Trinity Road, Handsworth, Birmingham, under his own name.

Messrs. J. J. Henderson and J. Sawyer, trading as "The Queens Road Electrical Stores," 4a, Queens Road, Southend-on-Sea, have dissolved partnership.

Electricity Supply

Lighting, Domestic, Power

Australia.—MELBOURNE.—The following statistics show the progress made by the Electric Supply Department, of which Mr. J. C. Lane is the engineer, during 1935, the 1934 figures being in parentheses: Electricity generated, 35,587,600 (23,931,700) kWh; purchased, 91,852,000 (93,927,900) kWh; sold, 112,939,847 (104,269,670) kWh—8.32 per cent. increase; revenue, £654,299 (£641,564); revenue per kWh sold, 1.390d. (1.487d.); expenditure, £489,909 (£471,152); cost per kWh purchased, 0.501d. (0.514d.); cost per kWh generated, 0.542d. (0.573d.); total cost per kWh sold, 1.041d. (1.084d.); connections, 168,653 (158.423) kW; consumers, 29,300 (28,584).

Aylesbury.—FARM SUPPLIES.—Having considered a report by the deputy borough electrical engineer on farm supplies, the Electricity Committee has decided to abolish the demand charge on farm buildings connected to the farmhouse service, all electricity used in such outbuildings (power up to 1 h.p.) being charged at 1d. per kWh. The Committee intends to submit other recommendations as regards farm supplies at a later date.

Barrow-in-Furness.—PROPOSED LOAN.—The Electricity Committee is seeking sanction to borrow £25,000 for mains and services.

Birmingham.—IMPORTANT ROAD-LIGHTING SCHEME.—It is proposed to carry out a scheme for the installation of electric-discharge lighting throughout the arterial roads leading from the centre of the city, on the outer circle and inner circle bus routes and on the more important secondary traffic routes. In addition, all roads forming a junction with these routes will have improved lighting for the first 100 yd. Approximately 200 miles of roadway is to be dealt with, and the total cost is estimated at £76,612.

GENERAL REDUCTIONS IN CHARGES.—There are to be reduced charges to all classes of consumers of electricity in the city and in the rural area of Warwickshire served by the Electricity Department, of which the engineer is Mr. F. Forrest; they are to take effect after the readings of the meters at the end of the September quarter. The more important reductions as regards the city area include ¼d. per kWh off the ordinary lighting rates for all consumptions up to 5,000 kWh per quarter, the maximum price under this tariff being reduced to 4d. per kWh; ¼d. per kWh is also to be taken off the long-hour and ¼d. off the factory-lighting rates. Electricity supplied through prepayment meters will be reduced by ¼d. per kWh to 4d. The running charge of the domestic contract tariff will become ¼d., and the fixed charges will be payable at the end of each quarter, a 5 per cent. discount being allowed for prompt payment of accounts. Charges to small-power consumers, to bakers (for electric ovens), and for shop window lighting are also to be reduced. In the Warwickshire area of supply there will be uniform differences between the rural tariff and that applying in the city area of ¼d. per kWh for lighting, ¼d. per kWh for power and ¼d. in the domestic contract-tariff running charge. Electricity is to be supplied from the high-voltage system during the hours of 6 p.m. and 7 a.m. for heating purposes on the thermal-storage principle at 0.2d. per kWh. Other important decisions are that after October 1st next no charge will be made for connecting premises within 60 ft. of the distribution mains, and also that the wiring of circuits for cookers supplied by the department will be carried out free. A kettle is also to be included with all cookers supplied on hire. Finally, facilities are to be provided for the hire and hire-purchase of electrical apparatus at the department's showrooms.

Bishop's Stortford.—ELECTRICITY TO REPLACE GAS.—A tender of £1,854 by the North Metropolitan Electric Power Supply Co. for public lighting in place of gas has been accepted by the Urban District Council.

Cannock.—GROWTH OF UNDERTAKING.—In his report on the working of the electricity undertaking during the past year the chief electrical engineer and manager (Mr. P. Wardle) observes that if the present rate of development continues the undertaking will become a "large" one (with an annual output exceeding 10,000,000 kWh) within two years. In 1935-36 sales increased by 11 per cent. to 8,423,469 kWh, the expansion under the domestic tariff being 49.5 per cent. At March 31st consumers numbered 7,464, an additional 1,004 having been connected during the year. There were 4,308 domestic appliances on hire against 2,688 a year earlier. The net profit at the end of the year was £2,402 (against £2,912).

Cardiff.—PURCHASE OF PENARTH UNDERTAKING.—The Electricity Committee has appointed a sub-committee to negotiate for the purchase of the electricity undertaking at Penarth, near Cardiff, now owned and controlled by the Penarth Electric Lighting Co. The Committee was previously informed by Mr. E. Jones, the city electrical engineer, that the Penarth Urban District Council had waived its right of purchasing the undertaking at a reasonable valuation without making any allowance for goodwill. This had been done on the advice of the Electricity Commissioners, who had stated that the running of the undertaking by the Penarth Council would not be a commercial proposition, and suggested that the assets of the Penarth Electric Lighting Co. should be taken over by the Cardiff Corporation. Five or six years ago, Mr. Jones continued, the Penarth Lighting Company estimated that it would cost £25,000 to extend high-voltage feeders in duplicate and provide sub-stations in the area, apart from the additional

cost of changing over from the existing d.c. lines to a.c. The whole cost, however, would not be greater than that of developing an entirely new area, and in the circumstances he recommended that the Penarth undertaking should be taken over by Cardiff Corporation.

Carlisle.—ELECTRICITY EXTENSIONS.—The City Council is to extend distribution cables at a cost of £1,500.

Cheltenham.—ESTATE SUPPLIES.—Consideration is being given by the Housing Committee to the question of supplying electricity to 283 houses on the St. Paul's estate at a cost of £3,086, and to eighty-five houses on the St. Peter's estate at a cost of £1,048.

Chesterfield.—INQUIRY.—A Ministry of Transport inquiry was held recently into the application of the Derbyshire and Notts Electric Power Company to erect an overhead line across a housing site at Highfields, North Wingfield. It was stated that the Rural District Council disapproved of high-voltage lines over houses.

Clacton.—CONSUMERS AND SALES.—There were 8,090 consumers at the end of March last, or more than a third of the estimated population (23,000), according to the annual report of Mr. G. Broadhurst, the electrical engineer to the Urban District Council, indicating that the area has been well developed. Of these, 761 were connected during the year, the proportional increase being 10 per cent. Sales rose by nearly 25 per cent. to 4,779,919 kWh, with domestic supplies up 62 per cent. Consumption per head of the population was 208 kWh.

Colne (Lancs).—SALES WELL UP.—Mr. J. H. Thompson, the electrical engineer and manager, reports a net profit of £742 on the year's working. The amount of energy sold was 5,507,987 kWh, an increase of 851,928 kWh (18.3 per cent.), this expansion being a record for any year since the undertaking was established. The loss in sales during the previous year occasioned by the abandonment of the tramway system has been more than made up in one year. The increase in domestic sales was 260,795 kWh (24.3 per cent.); power, 509,291 kWh (19.4 per cent.); and heating, 71,069 kWh (30.2 per cent.).

Coventry.—A BUSY YEAR.—Summing up the work of the Electricity Department during 1935-36, Mr. W. J. Marston, engineer and manager, says that the period has been a very busy one, and that the growth in the demand for supplies is an indication not only of the prevailing general industrial and commercial activity, but also of the growing appreciation of the value of electricity for domestic purposes. The latter conclusion is well justified. The number of electric cookers installed by the Department rose by 1,542 to 4,380 during the year, a notable achievement even in this electrical age. Wash-boilers increased by 267 to 554 and water-heaters by 431 to 1,173.

Eastbourne.—STREET LIGHTING.—A recommendation has been passed by the Electricity Committee for changing over a large part of the lighting system from hand to automatic switching at a cost of £750. The recently approved two-year programme for improved street lighting is now well in hand, the columns in a large part of King's Drive extending from the centre of the town to the borough boundary having been erected. Tests will shortly be carried out with various types of electric-discharge lighting.

Falkirk.—EXTENSIONS.—The Corporation is to apply for borrowing powers to carry out a scheme which includes the laying of new cables from the electricity works to Manor Street and from Etna sub-station to Abbotshaugh, the erection of a sub-station and extension to saw mills, and an extension in Blinkbonny Road, at a total cost of £4,220.

Faversham.—NEW PLANT.—The Town Council is applying for sanction to a loan of £3,205 for the extension of the sub-station at Cross Lane and additions to plant.

Felling-on-Tyne.—CABLE EXTENSIONS.—Plans by the North-Eastern Electric Supply Co., Ltd., for laying cables to the Nest House estate, and in Chillside Road, Coldwell Lane, Watermill Lane and Elldene Crescent, have been approved by the Electricity Committee.

Godmanchester.—INQUIRY.—At an inquiry on July 14th respecting an application by the Beds, Cambs and Hunts Electricity Co., Ltd., for permission to erect overhead cables in the borough, there was opposition by the Corporation on the ground of amenity and danger. The Town Clerk, referring to the question of danger, said that within a maximum radius of ten miles of the Town Hall there would shortly be two R.A.F. aerodromes, at Wyton and Upwood. Mr. W. Waters, chief assistant to the general manager of the company, said that the company had already negotiated with the Air Ministry in regard to the proposed supply, and had come to an agreement as to which lines should be laid underground for the safety of the airmen. The inspector intimated that the Minister of Transport would not give his consent in any case where the Air Ministry objected to the erection of overhead cables. The Air Ministry would not consider it necessary that low-voltage lines should be referred to it at all, as they must be in proximity to houses.

Greenock.—MAINS EXTENSIONS.—Approval has been given to a.c. low-voltage mains extensions in the Sinclair Street area at a cost of £981 and at Strone Farm at a cost of £3,380.

Great Yarmouth.—PREVENTING DAMAGE.—The protective apparatus against interruptions due to storms and other external causes, installed as an experiment on one of the high-voltage lines in the rural area, has proved satisfactory, and, subject to the approval of the Electricity Commissioners, £500 is to be expended by the Electricity Committee on fixing similar apparatus to two other overhead lines.

Headlam (Yorkshire).—ARRANGEMENTS FOR A SUPPLY.—Electricity is to be supplied to the district by the North-Eastern Electric Supply Co., Ltd. A 20,000-V overhead line will be erected from Gainford.

Irish Free State.—THE POULAPHOUCA SCHEME.—The Minister for Industry and Commerce was asked in the Dail if he intended to introduce the necessary legislation in connection with the Poulaphouca hydro-electric scheme in the present session. Mr. T. Derrig, Acting Minister for Industry and Commerce, said that the legislation was in course of preparation, but he could not say definitely whether it would be brought forward before the adjournment. If not, the Bill would be in the hands of deputies during the recess.

CLAIM AGAINST BOARD.—It is reported in *The Times* that Mr. George Hewson, the State Arbitrator, heard at Limerick on Saturday a claim by the Abbey Guild of Fishermen for £450,000 compensation for the loss of the fishery acquired by the Shannon Electricity Board. It was stated by Counsel that the guild was the oldest body of fishermen in the world. During the hearing the claim was reduced to £240,800. The Arbitrator reserved his decision.

Jarrow-on-Tyne.—STREET LIGHTING.—The question of replacing the present gas street-lighting system by electricity is to be considered by the Town Council, and the borough engineer is to make a report on the matter.

ELECTRICITY FOR COUNCIL HOUSES.—Following a recent plebiscite by the Town Council to ascertain the demand for electricity by Council house tenants, the Ministry of Health has sanctioned the borrowing of £4,425 for the installation of electricity in 830 houses. No contracts have yet been placed for the work.

Kingston-upon-Thames.—BATH EQUIPMENT.—It is proposed to install under-water lighting (£700) and loudspeaker equipment (£200) at the new baths.

LOANS.—The Electricity Committee proposes to apply for sanction to loans of £16,658 for mains and £8,000 for sub-stations.

London.—NEW ELECTRICAL INSTALLATION.—Approval has been given to a revised estimate of £12,500 for the renewal of the electrical system at the Central Criminal Court.

FULHAM.—The owners of West Kensington Court have intimated that, of the 158 flats in the building, 118 will be all-electric. In the others provision will be made for a gas supply, but they will also be wired for electric cookers and radiators; no other form of lighting but electricity will be installed. They have asked the Electricity Committee if it would be prepared to bear half the cost of the rising mains for the flats, or about £850. The Committee is unable to agree, but suggests a contribution of £500, subject to the owners undertaking that in the 118 all-electric flats no other form of lighting, cooking or heating will be installed for a period of at least five years.

The Electricity Committee is seeking sanction to borrow £10,000 for wiring and £65,000 and £30,000 for cables and switchgear for a supply to the Earl's Court Exhibition. Four new sub-stations are also to be provided at a cost of £9,026.

The L.C.C. has authorised the rewiring of the Western Hospital, Fulham, at a cost of £9,800.

ST. MARYLEBONE.—The Electricity Committee is to install rising mains at blocks of flats at a cost of £1,564, and has arranged to purchase ducts and cables from the London Power Co., Ltd., forming the company's transmission system in the borough from Grove Road to Oxford Street, for £15,000.

ST. PANCRAS.—Sanction to extensions of mains in various streets amounting to £2,393 is being sought by the Electricity Committee.

The Parliamentary and General Purposes Committee recommends the adoption of a contributory superannuation scheme, which 311 out of 323 employés of the Electricity Department have intimated their wish to join.

POPLAR.—Alderman C. W. Key, chairman of the Electricity Committee, stated last week that the undertaking's washboiler, water-heater and cooker campaign had been so successful that the amount of electricity consumed by such apparatus in 1935-36 was 2,315,000 kWh, against 528,000 kWh in the previous year—over four times as much.

STOKE NEWINGTON.—To supply the new town hall and blocks of flats now being erected the Electricity Committee is to carry out mains extensions at a cost of £1,418.

The Committee proposes to acquire a site for a sub-station at Manor Road.

STEPNEY.—It is proposed to introduce a special tariff for consumers occupying tenements owned by the London County Council. This will comprise a weekly standing charge of 10d. (two rooms), 1s. (three or four rooms) or 1s. 2d. (five rooms or more), with a running charge of ½d. per kWh. In the summer quarters consumptions over 500 kWh per quarter will, experimentally, be charged at ½d. per kWh. The L.C.C. is to be asked to collect the standing charges with the rentals, for which service it will receive 5 per cent. of the amount collected.

The Electricity Supply Committee contemplates making a start on changing-over the distribution system in the borough from d.c. to a.c. In a report on the subject the estimated expenditure on the first stage is given as £64,788.

Richmond (Yorks).—OVERHEAD LINES.—Plans by the North-Eastern Electric Supply Co., Ltd., for overhead lines at Gilling West have been approved by the R.D.C.

Southend-on-Sea.—NEW MAINS.—The Town Council has received sanction to a loan of £6,115 for mains in the added areas and £7,246 for mains and transformer station sites in the Wakering area.

Stockton-on-Tees.—NEW SUB-STATION.—The Town Council is to erect a sub-station in Norton Road at a cost of £2,800, and is applying for sanction to borrow this amount.

Stoke-on-Trent.—SUB-STATION.—Sanction to borrow £20,000 for sub-station extensions is being sought by the Electricity Committee.

Sunderland.—ELECTRICITY DEPARTMENT ADMINISTRATION.—Alderman J. R. Curbison has given notice that at the next meeting of the Town Council he will move " That the Council elect a special meeting of seven members who are not members of the Electricity Committee for the purpose of conducting a full and thorough inquiry into all the workings and administration of the Electricity Department during the last seven years (further back should they deem it necessary), such inquiry to cover capital expenditure, administration, trading, employment of staff and workmen, and any other relevant matters, and that when the inquiry is completed a full report be forwarded to each member of the Council with the special committee's comments and recommendations."

West Ham.—HOT WATER FOR A SHILLING PER WEEK.—The Electricity Committee has offered to install a 1½-gal. storage water-heater, carry out the necessary wiring and plumbing and include all the electricity used for an all-in cost of one shilling per week. Domestic-tariff consumers may pay a hire charge of 3s. 6d. per quarter, including wiring and plumbing, electricity used being charged at ½d. per kWh.

Williton.—RURAL EXTENSIONS.—The Minehead Electric Supply Co. has sought the consent of the Rural District Council to an Order authorising it to supply electricity in the parishes of Porlock, Luccombe, Selworthy and Oare. The company is taking over the area formerly served by the Porlock Electric Supply Co., and the proposed maximum charge is 10d. per kWh. The Council has referred the matter to a committee.

Workington.—A GOOD YEAR.—The annual report of the electricity undertaking for 1935-36, the eleventh year of its operation, affords interesting reading, and more especially as it covers the first full year of the operation of the system on the national grid, the inauguration of the new showrooms and offices, and the centralisation of the stores and staff. The increase in sales was 21.34 per cent., against 18.3 per cent. in the previous year, and there was a decrease in kWh lost of 8.701 per cent., while the load factor increased by 2.01 per cent. as a result of improvement in consumption for domestic purposes. There was a reduction of 0.04d. per kWh in the working costs. Income from the sale of electricity rose by £2,291, as against £1,215 in the year before, and the installation department and showrooms together executed work and sales to the value of £4,511, compared with £2,264 in the preceding year. Assisted-wiring installations purchased were eighty-six more than in the previous year.

Traction

Bristol.—SUGGESTED " INNER CIRCLE."—A correspondent writing in the *Bristol Evening Post* suggests the construction of an " Inner Circle " electric railway to solve the city's traffic problem. Existing lines (with six stations) would be used for the most part, linked by about two miles of tunnel. There would be three new stations.

Lytham St. Annes.—PETITIONS AGAINST TRANSPORT PLANS.—The eleven members of the Council who favour the sale of the transport undertaking to the Blackpool Corporation, but who were out-voted at a recent meeting of the Council when it was decided to supersede trams by buses under a scheme of co-ordination with Blackpool, have forwarded a petition to the Minister of Transport asking him to withhold sanction until an inquiry has been held into the Council's application to borrow £18,000, the cost of new buses. The minority has also petitioned the Traffic Commissioners against the issuing of bus licences.

Manchester.—TROLLEY-BUS PLANS.—The Parliamentary Bill authorising the Corporation to operate trolley-bus services having passed the House of Lords and the House of Commons Committee on Unopposed Bills, preparations are being made to implement the report of the general manager (Mr. R. Stuart Pilcher) on the necessary changes. It is proposed to acquire twenty vehicles of the fifty-six passenger type and twenty-three each seating sixty-eight passengers. The total cost is estimated at £112,306, including £8,506 for overhead equipment.

Reading.—NEW TRANSPORT SYSTEM.—The Mayor recently inaugurated the first trolley-bus service in the town.

South Shields.—INTRODUCTION OF TROLLEY-BUS SERVICE.—The first trolley-buses to be introduced in South Shields will be delivered next month, and it is expected that the service will be inaugurated by the beginning of October. The first route will be from the Market Place to Freemantle Road.

Southampton.—CONVERSION OF TRAMWAYS.—The Transport Committee has been given permission to apply for powers to convert the tramways to trolley-bus working.

Communications

Great Britain.—FARTHEST NORTH EXCHANGE.—A new telephone exchange at Durness, Sutherlandshire, was inaugurated recently.

TELEVISION ARRANGEMENTS.—According to the *Wireless World*, the arrangements for the television transmissions from the Alexandra Palace are as follows: Sound, 41.5 megacycles (7.23 metres), 3 kW; vision, 45 megacycles (6.66 metres), 17 kW.

United States.—RADIO REVENUE.—According to the *Daily Telegraph* Washington correspondent, broadcasting revenue in the United States last year amounted to £17,300,000. The figure, which is given in a report published by the Department of Commerce, represents the revenue of eight national and regional networks and of 561 broadcasting stations. About £5,000,000 was paid in salaries. The revenue of the B.B.C. last year was £2,472,572, staff salaries amounting to £94,460.

Time by Telephone

THE " talking clock " service of the Post Office Telephone Department was inaugurated on Friday afternoon last week. All one has to do is to dial " Tim " if connected to an automatic exchange, or ask a manual exchange operator for " Time," the exact time being announced in words every ten seconds.

Subscribers will be charged the cost of a single call to the Holborn exchange, wherein the apparatus has been installed. The circuit is automatically disconnected after three minutes, and calls initiated simultaneously in excess of 200 will receive the line-engaged signal. The electro-optical mechanism employed is entirely automatic (it was described in the ELECTRICAL REVIEW of April 10th, 1936) and has been installed in duplicate for continuous operation, day and night, with provision for automatic change-over in the event of interruption or departure from Greenwich mean time.

Major G. C. Tryon, Postmaster-General, who presided at the ceremony, explained that more than 100,000 Londoners rang up their exchanges every month to ask the time. They could now get it with an accuracy of one-tenth second from the speaking clock. Mr. H. Spencer Jones, the Astronomer Royal, who performed the inaugural ceremony, explained how sidereal and mean times are kept at the Royal Observatory, Greenwich, and how the P.O. speaking clock is synchronised every hour. Allowing for possible errors, the Observatory's standard mean time signals were generally accurate within five-hundredths of a second.

Capt. B. S. Cohen, chief of the G.P.O. Research Station, Dollis Hill, where the apparatus was designed and constructed, outlined the method of operation. He explained that to maintain an accuracy of one-tenth second it was necessary for the local regulating device to maintain the speed of the driving motor, which was of novel design, accurate to one part in 36,000. The whole mechanism was kept in step by a highly accurate seconds pendulum, which was itself regulated photo-electrically by a beam of light. This replacement of the usual regulating mechanical contact device by a light ray fulfilled one of the astronomer's ideal requirements for a free pendulum.

Similar speaking clocks are to be installed at provincial centres, probably at Manchester and Bristol.

On Friday last week the Postmaster-General (left) and the Astronomer Royal (Mr. H. Spencer Jones) inaugurated the new time-by-telephone system. In our picture Major Tryon is seen explaining the mechanism to the Astronomer Royal

Contract Information

Where "Contracts Open" are advertised in our "Official Notices" section the date of the issue is given in parentheses

Contracts Open

Aberdare.—August 24th. U.D.C. Motors and control gear for the change-over from d.c. to a.c. (See this issue.)

Ashford.—U.D.C. Electrical supplies to sixty-two houses on the Kingsnorth Road estate and eight houses at Kennington. H. Wilson, Electricity Works.

Australia.— SYDNEY.—November 2nd. County Council Electricity Undertaking. Two 50,000-kW steam turbo-alternators and auxiliary equipment at the Bunnerong power station. (T. 30523.)*

September 9th. Department of Railways (Electrical Branch). One 3,125-kVA, 50-cycle alternator and spares for the Lithgow power station. (T. 30565.)*

Bedford.—August 27th. Corporation. Permanent fire protection installations, with automatic and manual control, in the generating station and certain sub-stations. Borough electrical engineer, Electricity Offices, Prebend Street (deposit £1 1s.).

Birkenhead.—August 4th. Corporation. Rewiring of the Sessions Courts. Borough electrical engineer, Craven Street.

Bristol.—Watch Committee. Two sets of vehicle-actuated traffic signals. City engineer, 63, Queen Square.

Coventry.—August 8th. Electricity Committee. Two brick-built chimneys at the Longford generating station. (July 24th.)

Dewsbury.—August 7th. Borough Council. Meter boards, underground joint and disconnecting boxes, cables, conduit and fittings, house service cut-outs, earthenware pipes, cable covering tiles, lamps, meters, joint box compound, meter locks and seals, pavement frames and covers, and motors. (July 24th.)

East Retford.—Corporation. Two kiosks and transformers and e.h.v. and l.v. cables. (See this issue.)

Edinburgh.—September 18th. Borough Council. One 30,000-kW turbo-alternator set with condensing plant and auxiliaries, for the Portobello generating station. (July 24th.)

Fife.—August 10th. County Council. Electric lighting in thirty-six houses at North Queensferry. C. R. Douglas & Son, surveyors, Dunfermline (deposit £1 1s.).

Frome.—August 31st. U.D.C. Two sets of electrically driven centrifugal surface pumps in duplicate, for the new well at Egford. Parker, Pearson and Ross Hooper, engineers, Dallas Chambers, Chippenham, Wilts. (deposit £1).

Hazel Grove and Bramhall.—August 11th. U.D.C. Electricity Department. One 150-kVA, one 200-kVA and one 500-kVA transformers with externally operated off-load tap-changing gear. (See this issue.)

India.—SIMLA.—August 11th. Stores Department. Train lighting dynamos with motoring resistances and terminals; magnetic battery change-over switches and main magnetic switches. (T.Y. 30531.)*

August 27th. Inert cells, dry cells and sac elements for Leclanché type cells with and without ventilating tubes, as required during twelve months from December 1st, next. (T. 30539.)*

August 15th. Drilling, boring, tapping and studding machines, with motors and full electrical equipment and spares. (T. 30541.)*

Manchester.—August 25th. Electricity Committee. One motor-driven boiler feed pump for the Stuart Street power station. (See this issue.)

Middlesex.—August 26th. County Council. Electrical installation at Shenley Mental Hospital. (July 17th.)

Monmouthshire.—August 5th. County Council. Vehicle actuated traffic signals at the Dixton Cross Roads, Monmouth. County surveyor, 4, Gold Tops, Newport.

Newton-in-Makerfield.—August 15th. U.D.C. Electricity Department. Two 2,500-kVA transformers. (See this issue.)

New Zealand.—PUBLIC WORKS DEPARTMENT.—September 8th. 1,550 ft. of 11,000-V cables, cable boxes, wall bushings and studs. (T.Y. 30506.)*

WELLINGTON.—September 29th. Public Works Department. Twenty-five 110-kV single-phase potential transformers. (T.Y. 30510.)*

October 27th. Four 1,000 kVA single-phase transformers. (T.Y. 30512.)* Four 1,667-kVA single-phase transformers. (T.Y. 30511.)*

November 10th. One 5,000-kVA, 11-kV synchronous condenser. (T.Y. 30584.)*

Northern Ireland.—Belfast.—August 7th. Electricity Committee. Auto-transformer, battery-driven rail locomotive, feed-water meter, three-phase, l.v., high-rupturing capacity switchgear and five hydrants, oil fire extinguishing equipment, and portable fire extinguishers. (July 17th.)

August 10th. One 5,700-kVA, three-phase, neutral earthing compensator with limiting resistance for 6,600-V, three-phase system. (See this issue.)

August 10th. Town Council. One electrically driven centrifugal pump, with switchgear, piping, &c. City Surveyor's Department, Drainage Section, Room 94, City Hall.

Paisley.—September 4th. Corporation. Electric lighting, &c., at 782 houses on the Ferguslie Park estate. Master of Works Office, 16, Gilmour Street.

Pocklington (YORKSHIRE).—August 6th. Governors of Pocklington School. Electric lighting installation at Wilberforce Lodge buildings. County architect, County Hall, Beverley (deposit £3 3s.).

Sheffield.—August 10th. Electricity Committee. Works auxiliary 11-kV, three-phase, 150-mVA switchgear for the Neepsend generating station. (July 24th.).

South Africa.—PRETORIA.—August 6th. City Council. Power cables, cable and jointing boxes, transformers and switchgear, including 12,000-V and 6,600-V panels for transformers and feeders, &c. (T.Y. 30470.)*

JOHANNESBURG.—August 20th. City Council. H.v. switchgear and accessories, including control panels. (T.Y. 30468.)*

September 17th. Two 1,500-kVA and two 1,000-kVA transformers, two circuit-breaker units and link and fuse boxes, with accessories. (T.Y. 30551.)*

August 24th. Railways and Harbours Administration. Electric lamps required during twelve months from January 1st, 1937. (T. 30558.)*

August 15th. Fifteen sets of automatic point operated gear for use on 550-V d.c. (T.Y. 30527.)*

CAPE PROVINCE.—September 14th. Beaufort West Municipality. Plant and equipment in connection with the commission of the local system of electrical generation and distribution, and the erection of a new power station. (T.Y. 30567.)*

Southend-on-Sea.—August 11th. Electricity Department. Electrical installation work at the Municipal Hospital, Rochford, and at fifty-six houses on the Southview estate, Eastwood. (July 24th.)

Uruguay.—MONTEVIDEO.—August 20th. State Electricity Supply and Telephones Administration. 850 1,000-W lamps. (T.Y. 30538.)*

September 3rd. Sixty-eight three-phase meters for private lighting and power installations. (T.Y. 30549.)*

*Further particulars from the Department of Overseas Trade (Inquiry Room), 35, Old Queen Street, London, S.W.1.

Contracts Closed

Aberdeen.—The tender of A. McRobb, Ltd., has been accepted for the electrical work in connection with the new cubicle isolation block at the County Hospital, Stonehaven.

Bournemouth.—Lighting Committee. Accepted. 225 lamp posts and twenty-five meter posts (£542).—Revo Foundry Co. 300 street lanterns (£405).—W. Parkinson & Co.

Bradford.—Electricity Committee. Accepted. Two sets of 6,600-V reactors for the Valley Road power station.—B.T.H.

Brighton.—Electricity Committee. Accepted. Ventilation improvements at the power station engine room (£1,628).—James Howden & Co.

Cheltenham.—Electricity Committee. Accepted. Overhead lines to Salterley (£1,342).—B.I. Cables.

Coseley.—We reported in our last issue that the U.D.C. had accepted a tender by Messrs. A. E. Chapman & Co. for the wiring of seventy houses. Messrs. Chapman inform us that the price was incorrect and they withdrew their tender.

Darlington.—Town Council. Accepted. Rectifier equipment.—Hewittic Electric Co.

Durham.—C.C. Education Committee. Accepted. Electric lighting at Newbottle Council school (£240).—Falconar, Cross & Co.

Guisborough.—U.D.C. Accepted. Transformer for the electricity works.—B.T.H.

Hebden Bridge.—Education Committee. Accepted. Electric lighting at Stubbings schools.—Ackroyd & Young.

Jarrow-on-Tyne.—Town Council. Accepted. Electrical installations in 150 houses.—E. Nelson & Sons, South Shields.

London.—ISLINGTON.—Electricity Committee. 5,000-kVA Scott-connected transformer bank and regulator, with necessary cables and alterations to a gantry; the tenders are for two types, (A) the Scott bank of two 2,500-kVA transformers contained in one tank, and (B) each 2,500-kVA transformer contained in a separate tank :—

		Transformer bank and Regulator. £	Alterations to gantry. £	Cable per foot.
Hackbridge Electric Construction Co.* Recommended.	A	**2,700**	**171**	**10/- and 5/-**
	B	2,780		
British Electric Transformer Co. ...	A	2,993 (less 5%)	189 (less 5%)	10/- and 5/- (less 5%)
	B	—	—	—
Metropolitan Vickers Electrical Co. ...	A	2,843	180	9/6 and 4/9
	B	2,928		
General Electric Co.	A	2,843	180	10/- and 5/-
	B	2,928		
Johnson & Phillips	A	2,844	180	10/- and 5/-
	B	2,928		
C. A. Parsons & Co.	A	2,843	180	9/6 and 4/9
	B	2,928		
Ferranti, Ltd.	A	5,299	180	10/- and 5/-
	B	—	—	—

Neon sign at showrooms :—

	£		£
Brilliant Sign Co. (1907). Recommended	**279**	Franco British Electrical Co. ...	403
Francis Tube Lights	292	Universal Metal & Neon Works ...	426
Electrolumination	365	Boro' Electric Signs	453
Electric Sign Co.	385	A. C. Cossor	511
Claude-General Neon Lights ...	396	Maple & Co.	791

Special window display lighting installation (£422).—Holophane, Ltd.

POPLAR.—Contracts Committee. Accepted. Switchgear (£524).—Ferguson, Pailin.

STEPNEY.—Electricity Supply Committee. Recommended. Dismantling existing grit arrestors on Nos. 8 and 9 chimneys at the Limehouse generating station, supplying two "Centriflovane" arrestors with necessary repairs to chimneys, and dismantling arrestor on No. 12 chimney, with repairs.—Babcock & Wilcox, Ltd.

ST. MARYLEBONE.—Electricity Committee. Recommended. Further twelve months' supply of meters.—Chamberlain & Hookham, Ltd.; Ferranti, Ltd. Fire extinguishing apparatus at the power station and sub-stations (£10,418).—Walter Kidde & Co.

ST. PANCRAS.—Contracts and Stores Committee. Recommended. Additional l.v. switchgear for the new Town Hall sub-station (£538).—Met.-Vick. Electl. Co.

Accepted. Pulverised fuel equipment (£183).—Babcock & Wilcox, Ltd.

L.C.C.—Cables for the Northern Outfall Works:

	£		£
Harland and Wolff, Ltd. Accepted	**1,338**	Siemens Bros. & Co.	1,459
Pirelli-General Cable Works, Ltd.	1,413	British Insulated Cables, Ltd. ...	1,460
W. T. Henley's Telegraph Works Co.	1,458	Johnson and Phillips, Ltd. ...	1,469
		Standard Telephones and Cables	1,469

Wiring and fittings for electric lighting, heating and power at the Thomas Street (J.M.) and Central schools:

	£		£
A. Hawkins & Sons. Accepted...	**699**	E. and C. Champion	898
Pinching and Walton	734	Collins Electrical, Ltd.	910
City Electrical Co.	757	E. Beckwith & Co.	1,053
Ilford Electrical Co.	782	Houchin, Ltd.	1,150
Francis Polden & Co.	803		

STOKE NEWINGTON.—Electricity Committee. Recommended. Installation of rising mains at the Coronation and Imperial Avenue flats (£797).—W. B. & H. C. Cables, Ltd.

Newark.—Town Council. Accepted. 500-kVA transformer for the main sub-station (£400).—G.E.C.

Newcastle-on-Tyne.—City Council. Accepted. Electric lighting at the Northumberland Road Council school (£460).—Graham Berrie.

Stoke-on-Trent.—Housing Committee. Accepted. Electrical installations in ninety-two houses on the Goldenhill estate (£501).—J. Hilton; 184 houses on the estate (£1,074).—Edstan Electric.

Wallasey.—Town Council. Accepted. Seven switch pillars.—Drake & Gorham, Ltd. Cables for twelve months.—B.I. Cables, Ltd. Ordinary type meters for twelve months.—Ferranti, Ltd. Prepayment meters.—British Electric Meters, Ltd.

Wokingham.—Berkshire County Council. Recommended. Electric lighting at Institution (£122).—Morland & Sons.

Notes

A Converted Town Hall Clock

The adaptation of Maidstone Town Hall clock to synchronous electric drive is an instance of the way in which these motor-operated units can be used to modernise otherwise obsolete timekeepers which are not accurate enough to meet modern demands. The old clock was weight-driven, erected in 1813, and the mechanism, with its wheelwork, pendulum and escapement, was of considerable size. It drove two dials mounted on a projecting bracket over the roadway, and for more than one hundred years sounded the hours from a small turret surmounting the building. The original drive has been replaced by the small mechanism illustrated, on a baseplate measuring only nine by five inches. The small synchronous motor runs at 200 r.p.m. and is enclosed, together with the first stages of the reduction gear, in a circular casing (on the left) in a split ring bracket, the slackening of a single bolt permitting of rapid changing of motor units should faults develop. At present no electrical striking or chiming has been provided, but this would only mean the addition of two small units. The Maidstone clock unit was made and installed by the Synchronome Co.

The small electrical mechanism for the Maidstone Town Hall clock

An Illuminated Street Nameplate

Street nameplates are usually fixed high up on the walls of corner buildings. This is unsatisfactory from the point of view of motorists, and an attempt to remedy it has been made at Clarence Street, Kingston-on-Thames. Here, as an experiment, the street nameplate has been fitted into the kerb, a tubular type of filament lamp behind the glass plate, illuminating it at night. The installation comprises a box with the namepanel on one side which is inserted in the kerb in place of one of the stones. The panel bears the name of the street in black letters on a translucent yellow ground, and in front of this is a second glass plate, this time of clear glass, which protects the actual nameplate. The electricity for illuminating the nameplate is drawn from a nearby street lighting standard, and one time-switch controls both. The top of the box consists of a heavy steel plate that is flush with the adjoining kerbstones, and is secured by bolts that can easily be removed to give access to the lamps and connections. To prevent the entry of mud and water the glass panels are sealed into the box at the bottom and sides, but at the top an air-space is left for ventilation. The sign is quite effective at night, and it attracts attention without causing either pedestrians or vehicle drivers to look away from the road. It is the work of Mr. Hayden, of Croydon.

Radio Research in Australia

Report No. 10 of the Radio Research Board of Australia (Bulletin No. 100, Council for Scientific and Industrial Research, 314, Albert Street, East Melbourne, Victoria) contains constructional details of a narrow-sector directional recorder of atmospherics, based on the British Radio Research Board's design with some modifications. Charts obtained with this instrument at Canberra show that the atmospherics recorded at a frequency of 10 kc. come from two main sources: (*a*) tropical thunderstorm areas ranging in distance from North Queensland to Africa, of great activity, which recur daily in the same directions over long periods, with seasonal changes; and (*b*) sources of lower activity without regularity in time or place, which are of interest from the point of view of weather forecasting. The average geographical and seasonal distribution of sources of atmospherics over Eastern Australia, and their movement in the Tasman Sea area, have been traced with the aid of the automatic recorder at Canberra and a cathode-ray direction finder at Laverton.

Fatality

An inquest was held at Bradford last week on Mrs. Hilda Lister (49) who was stated to have received a fatal electric shock from a kettle on June 10th. According to the *Yorkshire Post* Mr. H. Lister, husband of the deceased, stated that an electric cooker and kettle were installed in his house in 1928, and in July last year the kettle was fitted with a new flex by the Bradford Corporation Electricity Department which had wired the house. The voltage was 230.

A witness said that she was on a visit to Mrs. Lister and while helping her was filling the kettle when she received a severe shock and let the kettle fall. Mrs. Lister refilled the kettle and put it on to boil to see if it was functioning properly. About two hours later the witness heard a cry in the kitchen and found Mrs. Lister on the concrete floor with boiling water from the kettle pouring over her.

Mr. V. W. Carter, an electrician, said that he examined the kettle after the accident and found that the earth wire was broken at the wall end of the flex. The flaw could not have been detected without dismantling the plug. The insulation was not broken. Another report by an electrical engineer stated that the earth wire was broken at both ends of the flex and when held in a certain position the earth wire and live wire touched.

A verdict that death was due to asphyxia following an electric shock was recorded.

Appointments Vacant

Examiners in the w/t and instrument sections, mechanical and electrical supervisors and temporary electrical engineering assistants for the Air Ministry.

Four sub-station shift charge engineers for the Swansea Electricity Department.

Full-time lecturer in electrical engineering at the Walsall Technical College for the Walsall Education Committee.

Electrical engineer and manager for the Hoylake U.D.C.

Working electrical and mechanical engineer for the Erith U.D.C.

(See our classified advertisements.)

Our Service Department

EVERY day inquiries of all kinds are received by the Editors, the bulk of them relating to the producers of specified classes of electrical goods. We are able to reply to most of these with the aid of our extensive records, but in a few cases we have to seek the assistance of our readers. This week we have been asked for the names and addresses of manufacturers of the following:—

UTILO electric cooker.

MARVEL kettle.

Readers should enclose stamped addressed envelopes when making their inquiries.

Our Personal Column

Electrical men are invited to keep readers of the "Electrical Review" posted concerning their movements

Lord Rutherford, Cavendish Professor of Experimental Physics and Director of the Cavendish Laboratory, Cambridge University, has been invited to preside at the jubilee session of the Indian Science Congress which is to be held in India in 1938.

It will be recalled that a short time ago the borough electrical engineer of Kingston-on-Thames (**Mr. T. A. Kingham**) was given three months' notice terminating his appointment. At the meeting of the Kingston Town Council on Tuesday, according to the *Surrey Comet*, the Electricity Committee reported the receipt of a letter from the National Association of Local Government Officers asking that the Council should rescind its resolution on the grounds that Mr. Kingham had been under a misapprehension regarding the Council's request that he should submit his resignation. The letter pointed out that Mr. Kingham had been in indifferent health for a considerable time, and the Association requested that Mr. Kingham should be permitted to retire on superannuation. The Electricity Committee said that it did not see its way to recommend the Council to take any further action.

At the same meeting the appointment of a new borough electrical engineer was considered, three names having been selected from a list of eighty-three applicants. The Council decided to appoint **Mr. E. J. Jarvis,** who is at present borough electrical engineer of Scarborough, to the position. The commencing salary is £1,100, rising by annual increments of £25 to £1,200.

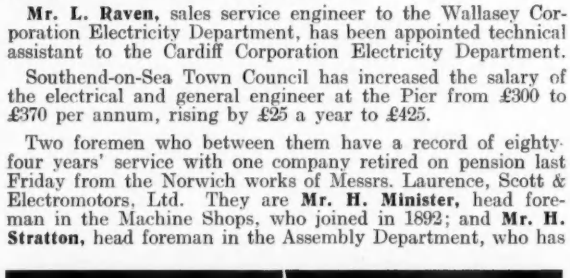
At the British Women's Amateur Athletic Association meeting held at the White City on July 18th, **Miss O. M. Hall,** who is employed in the Battery Works of the General Electric Company, Ltd., at Witton, and who is a member of the G.E.C. (Witton) Harriers, won the 400 and 800 metres British Championships in 58 6/10 secs. and 2 mins. 20½ secs. respectively, creating a new British record for the 400 metres. Miss Hall added to her honours last Saturday when she created a new world record for the women's half-mile at the Birchfield Harriers' Sports Meeting at Perry Barr. Her time was 2 min. 17⅘ sec.

Baron Yasushi Togo, managing director of the Japan Wireless Telegraph Co., is to be elected President in succession to the late Mr. Kenzo Iwahara.—*Reuter.*

Mr. L. Raven, sales service engineer to the Wallasey Corporation Electricity Department, has been appointed technical assistant to the Cardiff Corporation Electricity Department.

Southend-on-Sea Town Council has increased the salary of the electrical and general engineer at the Pier from £300 to £370 per annum, rising by £25 a year to £425.

Two foremen who between them have a record of eighty-four years' service with one company retired on pension last Friday from the Norwich works of Messrs. Laurence, Scott & Electromotors, Ltd. They are **Mr. H. Minister,** head foreman in the Machine Shops, who joined in 1892; and **Mr. H. Stratton,** head foreman in the Assembly Department, who has



Messrs. H. Stratton and H. Minister

served since 1896. When they joined the company the works occupied small premises in King Street, Norwich, where Mr. W. H. Scott founded the business in 1883. Messrs. Stratton and Minister worked on some of the earliest motors for marine service. One of their last jobs concerned 18,000 h.p. of electrical plant for the *Queen Mary*. Major Glendenning, who presented the two men with wallets, suitably filled, subscribed for by fellow employés, himself joined the company as long ago as 1896, and Mr. W. H. Scott, who is nearly seventy-five, still attends the works every day.

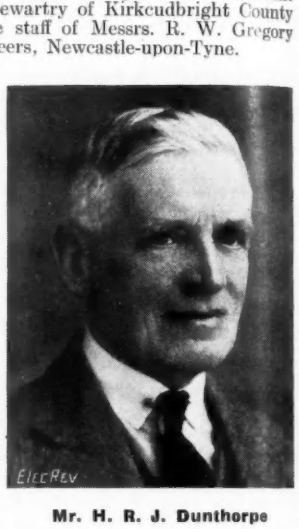
Mr. E. H. Bill, principal of the Electric Depôt, Ltd., Birmingham, was recently married at Southbourne to Miss Kathleen Murray.

Mr. Arthur Newcombe Rye has been elected a director of the Anglo-Portuguese Telephone Co., Ltd.

Miss Nan McGowan, daughter of Sir Harry McGowan, chairman of Imperial Industries, Ltd., was married last Friday to Mr. Dermot Daly.

Mr. J. S. McCulloch has resigned his position of assistant electrical engineer to the Stewartry of Kirkcudbright County Council, and has joined the staff of Messrs. R. W. Gregory & Partner, consulting engineers, Newcastle-upon-Tyne.

During his period of office as sectional engineer at Canterbury **Mr. H. R. J. Dunthorpe,** whose retirement after thirty-six years' service with the Post Office was recorded in our July 10th issue, the Maidstone telephone area, containing one main and seven satellite exchanges, and the Folkestone area, with five exchanges, have been converted to automatic working. A new repeater station was also built and equipped at St. Margaret's Bay, with new submarine cables to La Panne and Calais, together with a new main underground cable from London to St. Margaret's Bay, to improve and augment the telephone service to the Continent. We reproduce Mr. Dunthorpe's portrait with this note.



Mr. H. R. J. Dunthorpe

Mr. T. W. Ross, the author of the article on "Bus-bar Zone Protection," which appears on page 143 of this issue, joined the British Westinghouse Co. in 1904, and after serving an apprenticeship was placed on outside erection work. He was then given charge of the test department and for a time during the war was in charge of one of the works departments. Since the war he has been in charge of the engineering department of the Metropolitan-Vickers Co., Ltd., responsible for automatic gear. This includes protective gear, automatic sub-stations and generating stations, &c.

Mr. B. E. Stott, A.M.C.T., general manager of Ferrous Light Castings Ltd., Warrington, has been elected to a seat on the board of the company.

Mr. A. J. Dalton, deputy electrical engineer to the Dorchester Corporation, has been appointed chief engineer and manager of the Milford Haven undertaking. He served his apprenticeship with the Weymouth Corporation Electricity Department, where he was articled to Mr. J. H. Bolam, the late borough electrical engineer. Joining the Newcastle-upon-Tyne Electric Supply Co., Ltd., as an assistant engineer in the Operation Department, he was later transferred to the Lighting and Heating Department, where he was district engineer for two and a half years. After a few years as an electrical engineer on his own account he was appointed in March, 1934, to his present position at Dorchester. One aspect of his work in this town was dealt with in an article by him in our issue of February 28th last (page 307), entitled "Changing-over a Small Undertaking."

Mr. John Hebb, consumers' engineer of the Derby Corporation Electricity Department, has retired after thirty-five years' service. He joined the Electricity Department as a wireman in 1902, eight years after the department was started, and after experience in meter reading within four years he was appointed to the post of consumers' engineer, a new position created in an endeavour to increase the number of consumers. Mr. Hebb is a prominent member of the Derby Branch of the Electrical Power Engineers' Association, of which he was secretary for about fifteen years. Before joining the Electricity Department he served for 8½ years in the installation department of the old Midland Railway Co. at Derby.

Mr. J. Harrop, of the Ashton-under-Lyne Corporation Electricity Department, on the occasion of his marriage to Miss E. Bennett was presented by his colleagues with an electric reading lamp.

Mr. W. A. Harman, who has retired from the Weybridge staff of the London and Home Counties' Joint Electricity Authority, has been presented by his colleagues with a barometer, mounted in oak and chromium.

Mr. I. McInnes Robertson, of the Seaford & Newhaven Electricity Co., Ltd., who was recently married to Miss N. E. White, was presented by the manager and his colleagues with an electric clock.

Mr. Frank Pacy, for over forty years in the Worcester Corporation Electricity Dept., has retired, and has been presented by his colleagues with a walnut bureau and an illuminated address on vellum. The presentation was made by the city electrical engineer, Mr. C. M. Shaw.

Mr. J. M. Ashby has been elected an additional director of the Woking Electric Supply Co., Ltd.

Mr. H. V. Lewis has been promoted to the position of sales manager of Searsint, Ltd. He joined the company last February, before which he was connected with the radio trade as general sales manager of the Philco Radio and Television Corporation of Great Britain, Ltd., and afterwards with the Tungsram Electric Lamp Works (Great Britain), Ltd.

Mr. Charles Harnden, a director of Messrs. C. A. Harnden, Ltd., electrical engineers, of Hyde, was married on July 15th to Miss Winifred Blackmore, daughter of Mr. Robert Blackmore, formerly chief engineer to the Stalybridge, Hyde, Mossley and Dukinfield Joint Tramways and Electricity Board.

Obituary

Mr. C. F. Derry.—The funeral of Mr. C. F. Derry, contract manager of the Enfield Cable Works, Ltd., whose death was announced in our last issue, took place at South Norwood Cemetery last Saturday. In addition to the family mourners, who included Mrs. Derry (widow), Messrs. S. and F. A. Derry (brothers) and other relatives, there were present representatives of many electrical companies, among them being Mr. A. E. Flaskett (Enfield Cable Works, Ltd.), Mr. F. Plutte, Jun. (Enfield Rolling Mills, Ltd.), Mr. H. C. Wells (County of London Electric Supply Co., Ltd.), Messrs. W. Dixon and S. D. Whetman (Merz & McLellan), Mr. G. K. Johnson (British Insulated Cables, Ltd.), Mr. C. H. Frankland (Callender's Cable & Construction Co., Ltd.), Messrs. W. Moore, H. Willoughby and Ashton (Pirelli-General Cable Works, Ltd.), Mr. B. Gordon Ritter (Public Works Conciliation Board), and a large number of members of Mr. Derry's staff.

Mr. J. I. Gear.—The death occurred at Swansea last Saturday of Mr. John Irwin Gear, A.M.I.E.E., at the age of seventy-six. After serving at sea he became assistant electrical engineer at the Swansea docks under the old Swansea Harbour Trust, remaining in that position when the G.W.R. took over the undertaking. He retired in 1925.

Mr. M. W. Massey.—The death occurred on July 22nd at Seaford, Sussex, of Mr. Mervyn William Massey, late manager of the Cable Company, Cairo. He was fifty-one years of age.

Dr. Ing. G. Somaini.—The death is reported from Bologna, Italy, at the age of fifty-nine years, of Dr. Ing. Giacome Somaini, a professor at the School of Engineering in that town, who was well known in Italy for his work in connection with electrical measuring instruments and regenerative traction.

Financial Section

New Companies. Official Returns of Capital. Debenture Charges. Reports of Electrical Companies. Dividend Announcements. Transactions in Stocks and Shares

New Companies Registered

A. H. Bailey (Newport, I.W.), Ltd.—Private company. Registered July 25th. Capital, £800. Objects: To acquire the business of A. H. Bailey carried on by him at 53, Pyle Street, Newport, I.W., and to carry on the business of manufacturers and repairers of and dealers in electrical and mechanical apparatus, and in particular wireless sets, &c. The directors are: W. C. Bailey, Marvel House, Watergate Road, Newport, I.W., and two others. Registered office: 53, Pyle Street, Newport, I.W.

Flockhart, Russell & Stubbs, Ltd.—Private company. Registered July 25th. Capital, £1,500. Objects: To carry on the business of dealers in radio sets, radio-gramophones and musical instruments, technical advisers, electricians, manufacturers of radio and television sets, dealers in electrical appliances, &c. The directors are: Thomas M. Flockhart, 256, Slade Road, Erdington, Birmingham, and two others. Registered office: 256, Slade Road, Erdington, Birmingham.

South England Radio, Ltd.—Private company. Registered July 24th. Capital, £150. Objects: To carry on the business of manufacturers, operators of and dealers in radio, television and electrical apparatus and goods, &c. The subscribers are: D. M. Mactavish, 45, Earl's Court Road, S.W.5; and C. G. Wyld, 26, Court Farm Gardens, Manor Green Road, Epsom. Solicitors: Knapp Fisher & Wartnaby, Chapter Clerk's Office, Westminster Abbey, S.W.1.

Bacon & Coates, Ltd.—Private company. Registered July 24th. Capital, £2,000. Objects: To acquire the business of electrical engineers now carried on by Bacon & Coates at 75, Low Street, Keighley. The directors are: T. H. Coates, Holgate House, Cononley, near Skipton; and L. G. Bacon, 43, Hospital Road, Riddlesden, Keighley. Registered office: 75, Low Street, Keighley.

Elsmore's Radio & Television Service Co., Ltd.—Private company. Registered July 13th. Capital, £100. Objects: To carry on the business of radio, television and electrical engineers and contractors, &c. The directors are: G. E. R. Elsmore, "Bryn," 66, Terrace Road, Swansea, and H. Glick, 174, High Street, Swansea. Registered office: 66, Terrace Road, Swansea.

J. Mallory, Ltd.—Private company. Registered in Edinburgh July 13th. Capital, £100. Objects: To carry on the business of electricians and electrical, mechanical, motor and radio engineers and contractors, &c. The subscribers are: C. Holt, 68, Dundrennan Road, Langside, Glasgow, S.2, sales manager, and C. Berry, 16, Galbraith Drive, Glasgow, S.W.1, C.A. Secretary: C. Berry. Registered office: 160, Hope Street, Glasgow, C.2.

Castelco (Great Britain), Ltd.—Private company. Registered July 17th. Capital, £500. Objects: To carry on the business of electricians, mechanical engineers and manufacturers, workers and dealers in electricity, motive power and light, &c. The directors are: S. G. Leach, Glebelands, Withdean Road, Brighton; G. Dickson, 21, Eaglesfield Road, Shooters Hill, S.E.18; and J. Kastl, Vienna. Registered office: 91-3, Southwark Street, S.E.1.

Practical Services, Ltd.—Private company. Registered July 20th. Capital, £100. Objects: To carry on the business of manufacturers of and dealers in electrical, radio and television apparatus, public address loudspeaker equipment, &c. The directors are: W. H. Tucker, 1, Wood End Way, Northolt, Middlesex, radio engineer, and A. B. Calman, 130, Greenwich Road, S.E.10, general merchant. Registered office: 130, Wardour Street, W.1.

Ratcliff (Electric), Ltd.—Private company. Registered July 22nd. Capital, £3,000. Objects: To carry on the business of radio, electrical, refrigerator and mechanical engineers and contractors, manufacturers of and dealers in telephone and television apparatus, sound-recording equipment, and neon and electric signs, &c. The directors are: R. and F. Ratcliff, both of 338, Abbey Lane, Sheffield, 8. Registered office: Electric House, 83, Wicker, Sheffield, 3.

Lease-a-Radio, Ltd.—Private company. Registered July 21st. Capital, £100. Objects: To carry on the business of manufacturers and importers of and dealers in and vendors, hirers and lessors of radio receiving sets, radio-gramophones, television apparatus and electrical and musical instruments, &c. The directors are: H. Fletcher, Lynton, Sandfield Park, West Derby, Liverpool; C. Curtin, Leigh Mount, West Kirby, Ches; and W. L. C. Honnor, 44, Trafalgar Road, Birkdale, Lancs (all directors of Central Equipment, Ltd.). Registered office: 188, London Road, Liverpool.

Guildford Ignition & Battery Co., Ltd.—Private company. Registered July 20th. Capital, £1,000. Objects: To carry on the business of mechanical, electrical and wireless engineers, founders, smiths, machinists, manufacturers of and dealers in storage batteries, &c. The directors are: H. S. E. Flint, "Arisaig," Chestnut Avenue, Guildford, Surrey, F. Osbourn, "Taplow," Horsham Road, Cranleigh, Surrey, and E. W. Osbourn, 7, The Broadway, Woodbridge Road, Guildford. Secretary: F. Osbourn. Registered office: Broadway Works, Woodbridge Road, Guildford, Surrey.

Sheen Radio and Sports, Ltd.—Private company. Registered July 16th. Capital, £500. Objects: To carry on the business of dealers in or hirers of radio and television receivers, radio-gramophones, sports goods, refrigerators, electrical and household goods, &c. The directors are: Mrs. R. Stein, 381, Upper Richmond Road, East Sheen, S.W.14, and N. N. Sass, 101, Cowley Road, Ilford, sales manager.

Columbia Graphophone Co., Ltd.—Private company. Registered in Dublin July 16th. Nominal capital, £100. Objects: To carry on the business of makers of scientific and musical instruments, &c. The subscribers are: G. E. G. White, 13, Upper Ormond Quay, Dublin, solicitor, and C. T. B. White, 13, Upper Ormond Quay, Dublin, solicitor.

Marconiphone Co., Ltd.—Private company. Registered in Dublin on July 16th. Nominal capital, £100. Objects: To manufacture, assemble, repair and deal in electrical apparatus, &c. The subscribers and other particulars are similar to those of the Columbia Graphophone Co., Ltd.

Gramophone Co., Ltd.—Private company. Registered in Dublin on July 16th. Nominal capital, £100. Objects: To carry on the business of manufacturers of and dealers in gramophones, phonographs, radio sets, &c. The subscribers and other particulars are similar to those of the Columbia Graphophone Co., Ltd.

Redco Electrical Distributing Co., Ltd.—Private company. Registered July 23rd. Capital, £200. Objects: To carry on the business of electricians, electrical and mechanical engineers, &c. The life directors are: S. A. Nichols, 164, Vivian Avenue, Wembley (director of R. N. Electrical Repairs, Ltd.) and three others. Secretary: C. S. Ballard. Registered office: 12, Carey Street, S.W.1.

Strawn Electric, Ltd.—Private company. Registered July 23rd. Capital, £300. Objects: To carry on the business of manufacturers, repairers, importers and exporters of and dealers in clocks, watches, jewellery, time recorders, dynamos, motors, armatures, magnetos, batteries, &c. The permanent directors are: W. L. Strachan, 6, Devonshire Crescent; and J. Longhorn, 8, Devonshire Crescent, Leeds. Solicitor: John H. Bromley, 33, Park Square, Leeds. Registered office: 18a, Cambridge Road, Leeds, 7.

Returns of Electrical Companies

Kniveton Cable Works, Ltd.—Capital £7,000 in 4,500 preference and 2,500 ordinary shares of £1 each. Return dated April 29th, 1936. 4,500 preference and 2,224 ordinary shares taken up. £5,224 paid on 4,500 preference and 724 ordinary shares. £1,500 considered as paid on 1,500 ordinary shares. Mortgages and charges, £5,000.

Keswick Electric Light Co., Ltd.—Capital, £20,000 in 5,000 preference and 15,000 ordinary shares of £1. Return dated April 9th, 1936. 4,000 preference and 15,000 ordinary shares taken up. £13,000 paid on 13,000 ordinary. £6,000 considered as paid on 4,000 preference and 2,000 ordinary. Mortgages and charges, nil.

Millbrooke Radio, Ltd.—Capital, £500 in £1 shares. Return dated May 15th, 1936. 450 shares taken up. £450 paid. Mortgages and charges, nil.

United Telephone Cables, Ltd.—Capital, £1,000 in £1 shares. Return dated April 23rd, 1936. All shares taken up. £1,000 paid. Mortgages and charges, nil.

McMichael Radio, Ltd.—Capital, £250,000 in 150,000 preferred ordinary shares of £1 and 400,000 ordinary shares of 5s. each. Return dated April 9th, 1936. 143,788 preferred ordinary and 394,304 ordinary shares taken up. £179,864 paid on 143,788 preferred ordinary and 144,304 ordinary shares. £62,500 considered as paid on 250,000 ordinary shares. Mortgages and charges, nil.

Electric Sign Co., Ltd.—Capital, £5,000 in £1 shares. Return dated November 18th, 1935 (filed March 10th, 1936). All shares taken up. £1,000 paid, £4,000 considered as paid. Mortgages and charges, nil.

Aberayron and District Electricity Supply and Power Co., Ltd.—Capital £3,000 in £1 shares. Return dated April 14th, 1936. All shares taken up. £2 paid, £2,998 considered as paid. Mortgages and charges: £900.

Newcastle and District Electric Lighting Co., Ltd.—Capital, £600,000 in £1 shares. Return dated April 3rd, 1936. All shares taken up. £600,000 paid. Mortgages and charges: £150,000.

Kent Bros. Electric Wire Co., Ltd.—Capital £40,000 in 11,500 "A" ordinary, 3,500 "B" ordinary and 25,000 preference shares of £1. Return dated April 21st, 1936. 11,500 "A" ordinary, 2,300 "B" ordinary and 25,000 preference shares taken up. £27,800 paid on 500 "A" ordinary, 2,300 "B" ordinary and 25,000 preference. £11,000 considered as paid on 11,000 "A" ordinary. Mortgages and charges, nil.

Isle of Thanet Electric Supply Co., Ltd.—Capital, £500,000 in 282,000 6 per cent. preference, 150,000 ordinary and 68,000 unclassified shares of £1. Return dated April 1st, 1936. All preference and ordinary shares taken up. £222,000 paid on 222,000 preference shares. £210,000 considered as paid on 150,000 ordinary and 60,000 preference shares. Mortgages and charges: £255,061.

Jeary Electrical Co., Ltd.—Deposit on June 30th of deeds of 12, Errol Street, Finsbury, and proceeds to arise from any sale thereof, to secure all moneys due or to become due from the company to Lloyds Bank, Ltd., not exceeding £3,500.

Supremus Specialities, Ltd.—Issue on July 4th of £300 debentures, part of a series already registered.

Permaheat Safety Cushion Co., Ltd.—C. H. Mellor, 180/182, Corn Exchange Buildings, Fennel Street, Manchester, was appointed receiver on July 6th under powers contained in debenture dated September 16th, 1935.

"M.A." Sound System, Ltd.—Particulars filed of £500 debentures, authorised June 12th, 1936, charged on the company's undertaking and property, present and future, including uncalled capital, the amount of the present issue being £175.

Bishop Radio Stores, Ltd.—Capital, £100 in £1 shares. Return dated December 24th, 1935 (filed April 23rd, 1936). Ninety-two shares taken up. £92 paid. Mortgages and charges, nil.

Frederick Squire, Ltd.—Capital, £1,000 in £1 shares. Return dated December 31st, 1935 (filed March 4th, 1936). 500 shares taken up. £500 paid. Mortgages and charges, nil.

Baker & Hyman, Ltd.—Capital, £2,000 in £1 shares. Return dated March 18th, 1936. All shares taken up. £15 paid, £1,985 considered as paid. Mortgages and charges, nil.

Magenerator, Ltd.—Capital, £525 in 500 preference shares of £1 and 500 ordinary shares of 1s. Return dated March 28th, 1936. 275 preference and 300 ordinary shares taken up. £290 paid. Mortgages and charges, nil.

York Relay Services (1934), Ltd.—Capital, £16,000 in 9,000 7 per cent. cumulative preference shares of £1 and 28,000 ordinary shares of 5s. Return dated March 13th, 1936. 7,209 preference and 28,000 ordinary shares taken up. £8,036 10s. paid on 5,729 preference and 9,230 ordinary shares, £6,172 10s. considered as paid on 1,480 preference and 18,770 ordinary shares. Mortgages and charges, nil.

E. P. Allam & Co., Ltd.—Capital, £6,000 in £1 shares. Return dated March 12th, 1936. 5,280 shares taken up. £2 paid. £5,248 considered as paid. Mortgages and charges, nil.

Windsor Electrical Installation Co., Ltd.—Capital, £150,000 in 65,000 ordinary, 50,000 5 per cent. preference, 25,000 7 per cent. preference, and 10,000 unclassified shares of £1. Return dated March 12th, 1936. 65,000 ordinary, 23,532 5 per cent. preference, and 25,000 7 per cent. preference shares taken up. £88,532 paid on 65,000 ordinary and 23,532 5 per cent. preference. £25,000 considered as paid on 25,000 7 per cent. preference. Mortgages and charges, nil.

Sam Sharples, Ltd.—Capital, £1,000 in £1 shares. Return dated November 1st, 1935 (filed April 27th, 1936). 502 shares taken up. £502 paid. Mortgages and charges, nil.

Meteor Electric Lamp Co., Ltd.—Capital, £500 in £1 shares. Return dated March 11th, 1936. 100 shares taken up. £100 paid. Mortgages and charges, nil.

L. Norman Vivian, Ltd.—Debenture dated June 25th, 1936, to secure £500 charged on the company's undertaking and property, present and future, including uncalled capital. Holder: F. W. J. Sheath, 88, Grove Avenue, Hanwell.

Ashton Electrical Company (Preston), Ltd.—Second charge on Fylde Road Weaving Shed, Preston, dated June 26th, 1936, to secure all moneys due or to become due from the company to the District Bank, Ltd.

B.P. Electrical Co., Ltd.—Debenture, dated July 7th, 1936, to secure £300, charged on the company's property, present and future, including uncalled capital. Holder: R. N. Reed, 201, New Kings Road, S.W.

Southern Shades, Ltd.—Debenture dated June 24th, 1936, to secure £100, charged on the company's undertaking and property, present and future, including uncalled capital. Holder: A. J. Hawes, 79, The Drive, Ilford.

Kubex (London), Ltd.—Debenture dated July 2nd, 1936, to secure £600, charged on the company's undertaking and property, including uncalled capital. Holder: F. E. Turner, 2, Hardcastle Road, Preston.

British Insulated Cables (S.A.), Ltd.—Capital, £2,000 in £1 shares. Return dated March 11th, 1936. All shares taken up. £2,000 paid. Mortgages and charges, nil.

Mather & Platt, Ltd.—Capital, £2,500,000 in £400,000 preference stock and £1,365,660 ordinary stock and 736,340 shares of £1. Return dated March 10th, 1936. All preference and ordinary stock taken up. £630,660 paid, £1,133,000 considered as paid. Mortgages and charges, nil.

Electrical Manufacturers' Finance Co., Ltd.—Capital, £10,000 in £1 shares. Return dated March 18th, 1936. All shares taken up. £10,000 paid. Mortgages and charges, nil.

J. G. Sneath, Ltd.—Capital, £3,000 in £1 shares. Return dated March 23rd, 1936. All shares taken up. £1,969 paid, £1,031 considered as paid. Mortgages and charges, nil.

Western Electric Co., Ltd.—Capital, £20,000 in £1 shares. Return dated April 13th, 1936. All shares taken up. £20,000 paid. Mortgages and charges, nil.

Bolton Gate Co., Ltd.—The nominal capital has been increased by the addition of £19,900 in £1 ordinary shares beyond the registered capital of £100.

F. G. Laurie, Ltd.—The nominal capital has been increased by the addition of £800 in £1 ordinary shares beyond the registered capital of £200.

City Notes

Scophony, Ltd.—Information additional to that appearing in our issues of April 19th, 1935 (page 578), and July 24th, 1936 (page 132), has now been published with regard to this television company's present position and future programme, in accordance with Stock Exchange requirements. The Scophony system is said to have successfully overcome the chief difficulty in the way of practical television, namely, the inadequacy of the available light for projecting television pictures of satisfactory brightness and reasonable size, and no special difficulties stand in the way of direct projection on screens of any size. The more important basic inventions used are the "split focus," the "double image Kerr cell," the "beam convertor" and the "Jeffree light control." The company's laboratories have concentrated on the production of apparatus suitable for commercial exploitation. Direct television methods are used as distinct from intermediate recording methods. A reliable home receiver giving a 16 in. by 12 in. picture has been designed for manufacture at competitive prices. Medium size receivers (4 ft. 6 in. by 3 ft. 6 in. pictures) for small halls, schools, &c., and cinema receivers (12 ft. by 9 ft. pictures) are also completed or under construction. Other developments are in hand on methods for making television available in conjunction with the telephone, and generally on the application of television to the entertainment industry. The company states that it has entered into negotiations with Messrs. E. K. Cole, Ltd., with a view to granting a non-exclusive licence for the United Kingdom, covering the manufacture, sale, and distribution of apparatus for domestic use. About £16,000 is now available as working capital, and £35,000 more will accrue when the final instalment of 5s. per share on the new issue of 140,000 shares is paid on October 1st. The directors regard this working capital as sufficient for the company's present requirements, but additional working capital may be required later. Among the directors is Mr. Oscar Deutsch, chairman, Odeon Cinemas, Ltd.

The Victoria Falls & Transvaal Power Co., Ltd., held its annual general meeting on July 23rd. Mr. A. E. Hadley, chairman and managing director, who presided, said that they had had exceptional difficulty in supplying the increasing requirements of consumers at the dates they desired in view of the time required for the manufacture and installation of plant. The rapid increase in gold mining since the departure of the Union of South Africa from the gold standard had roughly doubled the activity and possibly the life of the gold-mining industry. Electricity sold in 1935 showed an increase of 13 per cent. over 1934, and totalled approximately 2,000 million kWh, and the rate of supply had again increased during the first half of the current year. Further large extensions of generating, transmission and distribution plant will be necessary, and preparations for these are already afoot. The natural place for new generating plant would be at the Klip station, and a scheme of co-operation with the Electricity Supply Commission arranged some years ago had proved most satisfactory and efficient and was, moreover, undoubtedly beneficial to consumers. The price of elec-

tricity sold was 5 per cent. lower than in 1934, and 10 per cent. lower than in 1933, the average price to-day being just under 0.3d. per kWh. As 70 per cent. of all improvements in earnings accrued to the consumer, there would not be an increase in profit proportionate to the increase in sales.

France Signs, Ltd., which holds the whole of the share capital of the Franco-British Electrical Co., Ltd., held its annual general meeting on July 22nd. The Marquess of Milford Haven, chairman, who presided, said that, while there had been a very substantial total of outright sales, a great part of the company's business was the supply of neon and reflex road signs on a hire and maintenance basis. They had practically completed factory extensions which would both enable them to produce more economically and provide facilities for a larger output. A new system of internal lighting by means of electric discharge tubes, an example of which might be seen at the new Dolcis building in Oxford Street, London, had been evolved and gave an extremely satisfactory artificial lighting, showing articles in their true colour values. A considerable amount of business was expected to develop eventually in this direction. Business generally was progressing satisfactorily, orders for the nine months ended June 30th being 27 per cent. in excess of those for the corresponding period of 1935.

The Provincial Tramways Co., Ltd., records a net profit of £13,349 for 1935, as compared with £9,353 for the preceding year. To this is added £2,360 surplus on adjustment of land liabilities and £6,975 brought in, making £22,686. After providing for debenture interest (£4,329), sinking fund (£786), and dividends on preference shares (£7,500), there remains £10,070. The directors do not recommend a dividend on the ordinary shares as they state that now that all the company's subsidiaries, except the Gosport and Fareham Omnibus Co., Ltd., have been disposed of, they propose to put the company into voluntary liquidation and form a new company. Resolutions giving effect to the proposal will be submitted to shareholders at an extraordinary meeting to be held shortly. Under the liquidation scheme preference shareholders will receive 25s. for each share plus their dividend up to the date of repayment, while ordinary shareholders will receive 4s. per share in cash, together with two 4s. ordinary shares in the proposed new company which is to be formed to take over the shares of the Gosport and Fareham Omnibus Co., Ltd., and any remaining surplus assets of the other subsidiaries.

Allgemeine Elektrizitäts Gesellschaft has practically completed negotiations for capital reorganisation, says the *Financial Times*. It is generally understood that the reduction in capital will be in ratio of 3 to 1, that is, from Rm.185,000,000 (about £15,400,000 at current rates) to roughly Rm.60,000,000 (£5,000,000). As the debit balance of the company totals about Rm.57,000,000 (£4,750,000) a cut of this nature was anticipated. After the cut the capital will be increased to almost its present size, and so far as is now ascertainable, the following leading shareholders in the company will partake in the capital increase: The American General Electric Company, which holds one-quarter of A.E.G.'s capital, and the largest German electrical holding company, the Gesfürel. The latter is expected to take over about Rm.30,000,000 (£2,500,000) of the A.E.G.'s new capital. It is probable that option rights will be granted to shareholders, possibly in the form of two new shares at 103 per cent. for five old shares.

The London Electrical & General Trust, Ltd.—The widening field of operation leading to the change of the name of the company last February from Electro Trust, Ltd., was outlined by Mr. H. S. H. Guinness, chairman, at the ordinary general meeting held last Friday. When the company was founded nine years ago, he said, its interests were largely in public utility undertakings on the Continent and in this country. Since then the scope for profitable investment in the electricity supply industry had narrowed considerably, and during the past few years, owing to disturbed political conditions on the Continent, their interests there had been greatly reduced and they had had to invest a greater proportion of their funds in general securities of the type usually held by investment trust companies.

The Para Electric Railways & Lighting Co., Ltd., has issued a circular to holders of its 6 per cent. first debenture stock stating that the company is faced with a programme of capital and renewals expenditure amounting to approximately £160,000, of which about three-fifths is capital expenditure and two-fifths renewals, to be expended during the next five years. The directors propose to create £100,000 prior lien 5½ per cent. debenture stock and to issue £75,000 at 98 per cent. Half-yearly payments on the 6 per cent. first debenture stock will be resumed on December 1st next and for the first five years a minimum of 2½ per cent. will be paid. All sinking fund payments will also be suspended for five years. The outstanding amount is £479,512. The debenture stock holders unanimously approved the proposals at a meeting held on Tuesday.

The Jerusalem Electric and Public Service Corporation, Ltd., records a profit of £P54,926 (against £P44,770) for the year ended March 31st last. To this was added £P3,488 brought forward, making £P58,415 (£P44,770). After providing for income tax £P9,875 (against £P5,000 to tax reserve), reserve £P5,000 (same, plus £P12,875 written off issue expenses), capital amortisation £P4,477 (nil), plant renewal £P15,400 (nil), and preference dividends £P12,206 (same), there remains £P10,457 (£P9,689). It is proposed to pay a dividend of 5 per cent. (against 4 per cent.) on the ordinary shares and to carry forward £P2,832.

W. & T. Avery, Ltd.—The belief that the company was now better equipped than at any time in its history to take advantage of the demands for increased production likely to be made upon it was expressed by Sir J. Fortescue Flannery, chairman, at the ordinary general meeting held on Tuesday. He said that the company had continued to equip the machine shops at the Soho Foundry with the most up-to-date machinery and new laboratories had been provided.

Falk, Stadelmann & Co., Ltd.—Presiding at the annual general meeting on July 23rd Mr. Max Falk, chairman, stated that the company had shared in the general improvement in the country's trade in spite of severe competition. At the same time, production costs had increased without a corresponding advance in selling prices, and following the revival in the engineering industries some departments had had to resort to the unsatisfactory and costly procedure of working in double shifts. Extension had been necessary at several of the company's works. All branches had been well employed, the electrical accessories and cable works having been particularly busy.

H. J. Baldwin & Co., Ltd., who are acquiring the business of cable cover manufacturers and distributors and engineers carried on by the partnership firm of Messrs. H. J. Baldwin & Co. (Distributors) and Baldwin Midland Products, Ltd. (Manufacturers), Baldwin Northern Products, Ltd. (Manufacturers) and Baldwin Engineering Equipments, Ltd. (Engineers), announces the issue of 20,000 6 per cent. cumulative preference shares of £1 each at par and 400,000 ordinary shares of 2s. each at 2s. 9d. per share. The amount of capital to be issued has already been over-applied for. The nominal capital has been increased by the addition of £99,900 beyond the registered capital of £100. The additional capital is divided into 20,000 6 per cent. cumulative preference shares of £1 and 799,000 ordinary shares of 2s. The company has now been converted into a public company.

Broom & Wade, Ltd.—On Monday at an extraordinary general meeting presided over by Mr. H. S. Broom (chairman) a resolution was approved increasing the company's capital to £265,000 by the creation of 160,000 new ordinary shares of 5s. each for the purpose of acquiring the whole of the share capital of B.E.N. Patents, Ltd.

Companies Struck off the Register.—The following companies were struck off the Register on July 24th:—Electrical Service & Supply Co., Ltd.; Mawlite Electric Lamp Co., Ltd.; and the Paragon Electric Welding Co., Ltd.

The Pernambuco Tramways & Power Co., Ltd.—At a meeting of debenture holders on July 31st a motion will be put forward to suspend for three years the sinking fund of the 5 per cent. debentures, of which £913,965 is outstanding.

The Clyde Valley Electrical Power Co.—A proposal to apply to the Electricity Commissioners for sanction to increase the capital by £2,100,000 to £5,000,000 was approved at an extraordinary meeting of shareholders held on Tuesday.

The Southern Railway Co., Ltd., is to pay interim dividends of 2½ per cent. on its guaranteed preference and preference stocks, together with an interim dividend of 1 per cent. on its preferred ordinary stock.

The Enfield Cable Works, Ltd., announces an interim dividend of 10 per cent. (same) on its ordinary share capital (which was increased last year by a capital bonus of 25 per cent.).

The London Associated Electricity Undertakings, Ltd., announce an interim dividend of 3 per cent. (same) on their ordinary stock.

The London Electric Supply Corporation, Ltd., announces an interim dividend of 3 per cent. on its ordinary and 6 per cent. preference shares.

The Palestine Electric Corporation, Ltd., announces a final dividend of 5 per cent., tax free, making 7½ per cent., tax free, for 1935 (same).

Mather and Platt, Ltd., have increased the interim dividend on their ordinary capital from 3 to 4 per cent.

The City of London Electric Lighting Co., Ltd., is maintaining its interim dividend at 3½ per cent.

The Metropolitan Electric Supply Co., Ltd., is maintaining its interim ordinary dividend at 3 per cent.

The Bristol Tramways & Carriage Co., Ltd., has declared an interim dividend of 3 per cent. on its ordinary shares.

Stocks and Shares

TUESDAY EVENING.

THE influence of the approach of August is beginning to manifest itself in various markets of the Stock Exchange. Business has fallen off to a noticeable extent in a number of departments which of late occupied public attention to a degree somewhat unusual at this particular season of the year. In what may be described as the armament group, comprising shares in companies connected with engineering, aviation, iron, coal and steel; and to a minor extent shipping, prices have been run up rather extravagantly. Speculation has played a large part in hoisting values which, though they will probably be justified by future events, may be already held to discount the latter. The talk, current about a fortnight ago, as to the likelihood of money becoming more expensive, has subsided. It is not expected that there will be any particular alteration, so far as the ease of the money market is concerned, for some time to come. Therefore the gilt-edged stocks are disposed to harden up, fixed-interest issues having come into renewed request. The newly issued South Metropolitan Electric 3¼ per cent. debenture stock is changing hands at 7s. 8d. premium over the price, 99, at which £500,000 was privately placed.

Electricity Supply Shares

Moderate selling in a slack market has produced an easy tendency in electricity supply shares. One explanation of the dullness is that some holders have been tempted to forgo the security of their own market for the more glittering prospects

of the electrical equipment field. Among shares of those companies which have just announced unchanged interim dividends, County of Londons shed 2s. to 53s., while Yorkshires, 45s., Electrical Distribution of Yorkshire, 47s., and Richmonds, 37s., are 6d. to 1s. down. More substantial losses are shown by Midland Counties, Northamptons and North Metropolitans. Edmundsons, after falling from 42s. to 40s. 9d., recovered to 43s. 6d. Electrical Finance and Securities moved up ¼ to 3½, and Midland Electric Powers are better at 45s.

In the overseas group, Perak Hydros, 27s. 9d. (after 29s. 6d.) and Nigerian Supply preferred, 23s., are firm, on the ground that both companies are benefiting from a growing demand for current in their respective areas. The tin-producing companies are largely responsible for extra consumption. Palestine "A" shares sagged to 47s., in spite of the dividend being maintained, on a larger capital, at the same rate as last year, East Africans are lower at 30s., as are Kalgoorlies at 13s. 9d.

Manufacturing and Equipment

In point of popularity with investors, electrical equipment shares are second only to the moment's favourites—iron, steel and engineering shares. So long as investors are prepared to concentrate their attention on the sound progress of home industries, and to turn only half an eye on the restless foreign scene, it is natural that much of the abundance of unemployed money should flow into the electrical equipment market, where there are many shares able satisfactorily to fulfil modern investment requirements.

Under the lead of General Electrics and the principal Cable equipment shares—with ready support from the telephone group—prices show, practically throughout the list, substantial gains on the week. General Electrics rose further to 84s. 6d., as against 78s. a fortnight ago: the preference are 1s. higher at 35s. Enfield Cables jumped ⅜ to 5⅝; British Insulated, Callenders and Johnson and Phillips all went ahead. Enfield Rolling Mills were again favoured, and gained 2s. to 24s. Electric Construction, after gaining 1/16 to £2 reacted to 1⅛; Telegraph Condensers are unchanged at 2⅞ after being 1/16 higher. Siemens and Telegraph Construction, both of which are believed to have received, of late, less than their due attention, advanced to the common level of 30s. Among telephone shares, Ericssons mounted to 2¾, Halls put on as much as 3s. to 24s. 3d., and International Automatic ordinary rose 1s. to 49s.

Crompton Parkinsons

From 87s., the price to which Crompton Parkinsons rose ten days ago, there has been a slant of about 6s. 6d., somewhat to the surprise of buyers who had given anything like the former figure. These previous purchases may have been encouraged by a very vague rumour to the effect that the company is making profits at the rate of something like £750,000 per annum. Such a figure seems to be super-optimistic, if the phrase may be permitted, and it is possible that heavy blocks of shares may have been sold by people who, having bought them much lower down, considered it wise to take the present profit, in view of the chance that disappointment may be felt when the actual figures appear. That Crompton Parkinson's are doing extraordinarily well, can be taken as a certainty, but rumour can easily run ahead of statistics. Although the price of the shares is probably set for higher levels, there may be intermediate fluctuations.

Television

The market for shares in the various television companies has fallen upon quiet days, but, in regard to the industry itself, events are moving steadily forward. Some of the people in close touch with the business affirm that in the course of the next few months, probably early next year, practical sets will be available for the use of the ordinary householder. There are even estimates as to what the development may be expected to cost, an initial outlay of £50 being guessed, at the moment, as a sum likely to be sufficient to cover the cost of making the necessary additions to the existing private sets. But at present these matters are largely a matter of guess-work.

Discriminating Demand

That buying is not of the haphazard variety, based simply on the prosperity and prospects of the industry as a whole, is shown by the fact that demand is heaviest where specially favourable factors are present.

The outstanding strength of Enfield Cable shares is based on recognition of the significance of the maintenance of the 10 per cent. interim dividend on capital enlarged by the free 25 per cent. scrip bonus accompanying the last final dividend of 15 per cent. Expectation now looks for a 25 per cent. distribution for the whole of the current year. This view assumes higher profits in 1936 than in 1935, when earnings fell short of the figure which would be required to pay the same dividend on the increased capital.

British Insulated are being bought partly on the chance of a bonus being given to shareholders at the end of the company's year. Hopes are based on the presence in the balance sheet of reserves falling short by only £100,000 of the £1,600,000 of ordinary capital. The company has, furthermore, through its holding of the International Automatic Telephone Company's "A" deferred capital, a useful stake in the progressive telephone industry.

Share List of Electrical Companies

HOME ELECTRICITY COMPANIES.

	Nom.	Dividend. Previous.	Dividend. Last.	Price. July 28.	Rise or Fall.	Yield p.c. £ s. d.
Bournemouth and Poole	1	15	15	77/6	—	3 17 5
City of London	1	7½	7½	37/–	—	4 1 1
Clyde Valley	1	7	8	45/–	—	3 11 1
County of London	1	10½	10½	53/–	–2/–	3 19 3
Edmundson's 7% Pref.	1	7	7	35/6	—	3 19 0
Do. Ord.	1	8	8	43/6	+1/6	3 13 7
Elec. Dis. Yorkshire	1	9	9	47/–	–1/–	3 16 7
Elec. Fin. and Securities	1	12½	12½	3½	+¼	3 11 5
Elec. Supply Corporation	1	11	11	59/6	—	3 14 0
Lancs Light and Power	1	7½	7½	38/–	–6d.	3 19 0
Lond. Assoc. Electric	1	—	7	35/–	—	4 0 0
London Electric	1	7	8	39/–	—	4 2 1
London Power Deb. Red.	Stock	5	5	108½	—	4 12 2
Metropolitan	1	10	10	51/–	–6d.	3 18 5
Midland Counties	1	7	7½	39/–	–2/–	3 17 0
Mid. Elec. Power	1	8	8	45/–	+⅛	3 11 1
North Eastern Electric Ordinary	1	6	6	34/–	—	3 10 7
Do. 7% Pref.	1	7	7	35/6	—	3 19 9
Northampton	1	10	10	52/6	—⅛	3 16 2
Notting Hill 6% Pref.	10	6	6	14½	—	4 4 3
North Met. Elec. Ordinary	1	10	10	53/9	–¼	3 14 5
Do. do. 6% Pref.	1	6	6	32/–	—	3 15 0
Scottish Power	1	8	8	43/–	—	3 14 5
South London	1	7	7	34/6	—	4 1 2
Whitehall Elec. Invst. 7½% Pref.	1	7½	7½	23/6	–6d.	6 7 8
Yorkshire Elec.	1	8	8	45/–	–6d.	3 11 1

PUBLIC BOARDS.

Central Electricity, 1950–70	Stock	5	5	118	—	4 4 9
Do. 1955–75	,,	5	5	120	—	4 3 4
Do. 1951–73	,,	4½	4½	111	—	4 1 1
Do. 1963–93	,,	—	3½	104	+1	3 7 4
London Elec. Trans. Gtd.	,,	—	2½	96	—	2 12 1
London & Home Counties, 1955–75	,,	4½	4½	114	+1	3 19 0
London Passenger Transport, A	,,	—	4½	122½	—	3 13 6
Do. do. B	,,	—	5	128½	—	3 17 10
Do. do. C	,,	3½	4	105	—	3 16 2
West Midlands Joint Elec. 1948–68	,,	—	5	116½	—	4 5 10

TELEGRAPH AND TELEPHONE.

American Tel. & Tel.	$100	9	9	170½	—	5 5 0
Anglo-Am. Tel. Pref.	Stock	6	6	127½	—	4 14 1
Do. Def.	,,	1½	1½	31	—	4 16 9
Cable & Wireless 5½% Pref.	,,	4½	5½	103	—	5 6 10
Do. A. 7½% Ord.	,,	Nil	Nil	21	–½	—
Do. B. Ord.	,,	Nil	Nil	6½	—	—
Globe Tel. & Tel. Ord.	10	3½*	4½*	14½	—	3 2 1
Do. Do. Pref.	10	6	6	14½	—	4 2 9
Great Northern Tel.	10	20	20	45	—	4 9 0
Marconi-Marine	1	10	7½	33/9	—⅛	4 9 0
Oriental Telephone Ord.	1	12*	12*	3½	—	3 13 10

HOME AND FOREIGN TRAMS, ETC.

Anglo-Arg. Trams First Pref.	5	Nil	Nil	1/–	—	—
Do. do. 2nd Pref.	5	Nil	Nil	9d.	—	—
Do. do. 5% Deb.	Stock	Nil	Nil	5	—	—
British Electric Traction Df. Ord.	,,	5	5	1450	—	—
Do. do. Pref. Ord.	,,	8	8	175½	—	4 11 2
Brazil Traction	100	—	30 cts.	12½	—	—
Brit. Columbia Elec. Rly. Pce.	Stock	5	5	102½	—	4 17 7
Mexican Light Common	100	Nil	Nil	3½	—	—
Do. 1st Bonds	$500	5	5	53	—	—
Victoria Falls Ord.	1	20	12	4	—⅛	3 0 0
West Riding	1	5	6½	50/–	—	2 12 9

MANUFACTURING COMPANIES.

Aron Electricity Ord.	1	10	15	65/–	—	4 12 4
Assoc. Elec. Ord.	1	6	8	51/–	–1/–	3 2 9
Do. Pref.	1	8	8	41/–	—	3 18 1
Babcock & Wilcox	1	8	8	52/9	+2/9	3 0 9
British Aluminium Ord.	1	7½	7½	39/–	—	3 17 0
British Insulated Ord.	1	15	20	5⅝	+⅛	3 12 0
Brush Ord.	Stock	Nil	Nil	39½	—	—
Callender's	1	15	15	4⅜	+⅛	3 8 7
Do. 6½% Pref.	1	6½	6½	32/6	—	4 0 0
Crompton Parkinson Ord.	5/–	—	12½	4⅛	–⅛	—
Do. 8% Pref.	1	8	8	38/9	—	4 2 6
Edison Swan 1st Pref.	1	7½	7½	30/–xd.	—	5 0 0
Electric Construction	1	3½	7	37/6	–⅛	3 14 8
Enfield Cable Ord.	1	25	25	5⅝	+⅜	4 9 0
English Electric	1	Nil	Nil	23/–	—	—
Do. Do. Pref.	1	Nil	Nil	27/–	—	—
Ericsson Tel.	5/–	24	20*	2¾	+⅛	1 16 4
Ever Ready	5/–	35	35	26/0	–6d.	6 14 7
Ferranti Pref.	1	7	7	28/9	—	4 17 5
G.E.C. Pref.	1	6½	6½	35/–	+1/–	3 14 4
Do. Ord.	1	10	15	84/6	+1/6	3 11 0
Henleys	1	30	30	7⅛	+⅛	3 18 8
Do. 4½% Pref.	5	4½	4½	5⅝	—	3 18 3
India-Rubber Preferred	1	—	5½	1¼	—	4 17 9
Johnson & Phillips	1	7½	10	48/3	+9d.	4 3 0
Lancashire Dynamo	1	5	10	2⅝	—	3 9 7
Siemens Ord.	1	4	6	30/–	+⅛	4 0 0
Telegraph Construction	£1	Nil	Nil	30/–	+⅛	—

* Dividends are paid free of Income Tax.

Published Specifications

Compiled expressly for this journal by a firm of chartered patent agents. The numbers in parenthesis are those under which the specifications will be numbered and abridged and all subsequent proceedings will be taken.

1934

30545. "Coils for producing a magnetic field of approximately uniform flux density, for use, for example, with cathode-ray tubes." M. Bowman-Manifold and A. D. Blumlein. October 24th, 1934. (Cognate application, 12052/35.) (449533.)

31538. "Apparatus for electrically welding tube blanks." Clayton, Mark & Co. November 16th, 1933. (Addition to 362477.) (449605.)

31996. "Amplifiers for use in connection with telephone receivers." V. Gerstenberg. December 5th, 1935. (449606.)

34485. "Manufacture of permanent magnets." W. W. Triggs (E. O. Probst and A. Rauch). November 30th, 1934. (449682.)

36952. "Loud-speaking and amplified telephone systems." Téléphone Privé National. December 30th, 1933. (Cognate applications, 36953/34 and 36954/34.) (449609.)

37166. "Lighting fittings." H. Biggleston (trading as Electric Street Lighting Apparatus Co.) and D. Wilman. December 28th, 1934. (449758.)

37246. "Switches for controlling electric direction indicators on motor vehicles." J. Lucas, Ltd., and O. Lucas. December 29th, 1934. (449554.)

37349. "Electricity prepayment meters." English Electric Co., Ltd., and G. Tilstone. December 31st, 1934. (449556.)

37351. "Apparatus for the synchronisation of electric motors." E. H. Day. December 31st, 1934. (449616.)

37357. "Manufacture of indirectly heated cathodes for luminous electric discharge devices, cathode-ray tubes, and the like." General Electric Co., Ltd., and C. J. Smithells. December 31st, 1934. (449617.)

37379. "High-frquency coils provided with magnetisable cores." Siemens & Halske Akt.-Ges. December 29th, 1933. (Cognate applications, 37380/34 and 37381/34.) (449763.)

37411. "Electrical condensers." Marconi's Wireless Telegraph Co., Ltd. December 29th, 1933. (449867.)

37420. "Electrical measuring instruments." W. L. Beck and Cambridge Instrument Co., Ltd. December 31st, 1934. (449623.)

1935

2. "Method and means for terminating electric cables." Standard Telephones & Cables, Ltd., T. R. Scott and J. K. Webb. January 1st, 1935. (449868.)

3. "Electro-cardiographs." Standard Telephones & Cables, Ltd., C. H. W. Brookes-Smith and H. W. Walker. January 1st, 1935. (449686.)

37. "Secondary cells." F. Hochwald. May 3rd, 1934. (Cognate application 38/35. (449687.)

135. "Electric oscillation generators." L. H. Paddle. January 2nd, 1935. (449871.)

215. "Systems for amplifying low-frequency currents." L. H. Paddle. January 3rd, 1935. (449874.)

260. "Electric drives and control systems for rolling mills." Westinghouse Electric and Manufacturing Co. January 3rd, 1934. (449877.)

291. "Electric lighting sets for use in connection with pedal and other cycles." F. J. Miller and N. V. Miller. January 4th, 1935. (449878.)

452. "Electric incandescent filament lamps of tubular form." R. Maas. January 5th, 1935. (449693.)

653. "Testing pieces of magnetic material." British Thomson-Houston Co., Ltd. January 8th, 1934. (449881.)

771. "Electric condensers." Porzellanfabrik Kahla. January 11th, 1934. (449882.)

796. "Electrical measuring apparatus." F. A. Peachy. January 9th, 1935. (449809.)

839. "Lighting devices and systems." S. H. Lee. January 10th, 1935. (449810.)

876. "Electric batteries." Ever Ready Co. (Great Britain), Ltd., and A. H. Sheppard. January 10th, 1935. (449624.)

885. "Electric motors." British Sangamo Co., Ltd., and F. R. Butherus. January 10th, 1935. (449885.)

1009. "Methods of and apparatus for the manufacture of conduit for carrying conductors for use in electrical circuits." Westinghouse Electric & Manufacturing Co. July 14th, 1934. (449625.)

1023. "Illuminating devices." G. V. Downer. January 11th, 1935. (449626.)

1229. "Methods of echo sounding and means therefor." H. Hughes & Son, Ltd., and D. O. Sproule. January 14th, 1935. (449623.)

1249. "Variable electric condensers." A. C. Cossor, Ltd., and D. G. Rennett. January 14th, 1935. (449688.)

4495. "Plug-and-socket connectors for electric circuits." C. L. Arnold, R. W. Dowsett and M.K. Electric, Ltd. February 12th, 1935. (449631.)

5590. "Electric heating apparatus." Johnson & Phillips, Ltd., and F. Smith. February 21st, 1935. (449632.)

5612. "Electrical multiple connection distribution boards." Allmänna Svenska Elektriska Aktiebolaget. September 5th, 1934. (449703.)

7574. "Control systems for electrically propelled vehicles." Westinghouse Electric & Manufacturing Co. March 15th, 1934. (449821.)

8387. "Cathode-ray tubes for use, for example, in television." General Electric Co., Ltd., and D. C. Espley. March 18th, 1935. (449822.)

8712. "Holders for valves and like electrical devices." General Electric Co., Ltd., and H. C. Hannam-Clark. March 20th, 1935. (449706.)

9006. "Process and various kinds of apparatus for the production of pictures by means of electric charges." Egyesült Izzólámpa es Villa-Mossági Reszvenytarsasag. March 22nd, 1934. (449824.)

10837. "Lighting fittings." C. H. Bell & Co., Ltd., and G. W. Collinson. April 8th, 1935. (449581.)

10989. "Trunk-communication electric cables comprising one or more screened core groups." Siemens & Halske Akt.-Ges. July 17th, 1934. (449582.)

11300. "Electric conductor couplings of the plug-and-socket type." C. H. Parsons, Ltd., and G. B. Handley. April 12th, 1935. (449831.)

16874. "Telephone systems." Soc. Telefonica Interregionale Piemontese e Lombarda S.T.I.P.E.L. June 12th, 1934. (449838.)

17037 "Electrolytic condensers." Plessey Co., Ltd. (P. R. Mallory & Co., Inc.). June 13th, 1935. (449839.)

17360. "Primary batteries." National Carbon Co., Inc. August 17th, 1934. (449587.)

18683. "Bushing insulators for electrical apparatus." British Thomson-Houston Co., Ltd. June 30th, 1934. (449842.)

18816. "Machines for manufacturing incandescent electric lamps." British Thomson-Houston Co., Ltd. June 30th, 1934. (449590.)

18863. "Electrolytic condensers." Plessey Co., Ltd. (P. R. Mallory & Co., Inc.). July 2nd, 1935. (449645.)

19964. "Telegraph systems." C. Lorenz Akt.-Ges. July 16th, 1934. (449844.)

20636. "Electric heating resistance elements and process of manufacturing same." Soc. Anon. Manufacture Générale Métallurgique. August 29th, 1934. (Addition to 16480/35.) (449646.)

24705. "Electric discharge tubes and screens for use therein." Naamlooze Vennootschap Philips' Gloeilampenfabrieken. October 9th, 1934. (449727.)

26103. "Electron-discharge devices." Standard Telephones & Cables, Ltd. (Western Electric Co., Inc.). September 20th, 1935. (Convention date not granted.) (449655.)

27872. "Electric heating plates." British Thomson-Houston Co., Ltd. October 11th, 1934. (449733.)

30977. "Signalling systems for giving signal indications on trains controlled magnetically from the track." Vereinigte Eisenbahn-Signal-Werke Ges. November 20th, 1934. (449662.)

31823. "Joints for electric cables." Okonite Co. and R. C. Waldron. November 16th, 1935. (449737.)

33583. "Switches for bases for electric flat-irons." R. Kiechel and C. Solhardt (trading as C. Solhardt & Co.). December 6th, 1934. (449854.)

35584. "Electrical interference suppressors." P. A. Sporing and Telegraph Condenser Co., Ltd. December 23rd, 1935. (449742.)

35741. "Circuit arrangement for the remote control of the driving motors of telegraph apparatus." Siemens & Halske Akt.-Ges. January 9th, 1935. (449857.)

1936

463. "Thermionic oscillation generators, particularly adapted for use in television receivers." Hazeltine Corporation. February 9th, 1935. (449743.)

871. "Electric accumulators." Chloride Electrical Storage Co., Ltd., and A. W. Browne. January 10th, 1936. (449744.)

1351. "Electric radiation furnaces." Soc. Anon des Manufactures des Glaces et Produits Chimiques de St. Gobain, Chauny and Cirey. January 16th, 1935. (449745.)

3104. "Electrical contacts." British Thomson-Houston Co., Ltd. February 1st, 1935. (449797.)

4431. "Casings for Pupin coils." Naamlooze Vennootschap Philips' Gloeilampenfabrieken. March 11th, 1935. (449747.)

4884. "Vehicle and aircraft remote directional lamp reflector control." G. A. Service. February 18th, 1936. (449748.)

5648. "Electric arc lamps." British Thomson-Houston Co., Ltd. February 26th, 1935. (449862.)

6795. "Small synchronous motors." K. J. Horstmann and Horstmann Gear Co., Ltd. March 6th, 1936. (449863.)

7075. "Prepayment meters, more particularly electricity prepayment meters." English Electric Co., Ltd., and G. Tilstone. December 31st, 1934. (Divided out of 449556.) (449673.)

7076-7. "Electricity prepayment meters." English Electric Co., Ltd., and G. Tilstone. December 31st, 1934. (Divided out of 449556.) (449674-5.)

Trade Mark Applications

The following are among the recent applications for British trade marks. Objections against any of the proposed marks may be entered within one month from July 22nd:—

Sortator. No. 569302. Class 6. Machinery of all kinds.—Ericsson Telephones, Ltd., International Buildings, 67-73, Kingsway, London, W.C.2.

Ronel. No. 567254. Class 8. Philosophical and scientific instruments and apparatus for useful purposes.—Robinson, Nelson & Co., Ltd., Faraday House, Sale, Manchester.

Claudegen. No. 567985. Class 8. Electric-discharge lamps not for surgical or curative purposes, and not being ordinary electric incandescent lamps.—Claude-General Neon Lights, Ltd., Pitman House, Parker Street, Kingsway, London, W.C.2.

Reliance. No. 568795. Class 8. Electric batteries and accumulators (not for medical purposes).—R. G. W. Brown & Co., Ltd., 11-13, Princes Street, Dundee.

Domestic Electrical Training

Certificates gained by the students of the London School of Electrical Domestic Science were presented at a meeting held at the Basil Hotel, Knightsbridge, on July 24th, when the principal, Miss H. M. M. Minoprio, reported on the term's work. Among the visitors were Miss Haslett, C.B.E., Mr. H. T. Young, Lady Snell, Col. R. E. Crompton, C.B., Mr. A. C. Cramb, and Mr. F. R. Yerbury.

New Work for Contractors

Particulars of new works and building schemes for the use of electrical installation contractors and traders

Publication in this list is no guarantee that electrical work is definitely included. Alleged inaccuracies should be reported to the Editors.

Aberystwyth.—Extensions to Aberystwyth and Cardiganshire General Hospital (£20,000); secretary.

Alloa.—Houses (128); burgh surveyor.

Alnwick.—Houses (110), St. Thomas' Close estate; R. Carse and Sons, builders, Amble.

Atherstone (WARWICKSHIRE).—Cinema, South Street and Long Street, for the Regal (Atherstone), Ltd.

Aylesbury.—Houses (20), Limes Avenue, for H. C. Janes, Ltd.

Basingstoke.—Factory for Kelvin, Bottomley and Baird, Ltd., Glasgow.

Bathgate.—Houses (50), Mill Road and Cochrane Street; A. L. Reid, burgh surveyor, 32, Hopetoun Street.

Beckenham.—School, Witham Road, for Borough E.C.; J. R. Hambridge, education officer.

Bedford.—Houses (49); R.D.C. surveyor.

Benfieldside (Co. DURHAM).—Houses (100); T. P. Leith, U.D.C. surveyor, Council Offices.

Bentley (YORKSHIRE).—Houses (100), near Great North Road, for A. Thomson.

Berkshire.—Boys' secondary school, Windsor (£18,500); director of education, Reading.

Birkenhead.—Junior instruction centre and school, Prenton; director of education.

Birmingham.—Houses (1,000); city engineer. Houses (3,392), Pheasey Farm estate; First National Housing Trust, Ltd. Cinema, for the Odeon Theatres, Ltd., Pershore Road South, King's Norton; W. H. Weedon, architect, 84, Colmore Row, Birmingham. Civic centre buildings (£259,550); T. Cecil Howitt, architect, Nottingham. Factory premises, Hospital Street, for Smith & Davis, Ltd.; C. Bryant & Son, builders, Whitmore Road. Fire station, Erdington (£20,800); T. Wynne Thomas, architect. Garage and showrooms, for City Garages, Dean Street, 2 (£30,000), with electrical work; H. Willcock & Co., Ltd., builders, Darlington Street, Wolverhampton. Additions to the Cincinnati Milling Machines, Ltd., Tyburn (£30,000), with electrical work; S. J. Smith (Bidford), Ltd., builders, 205, Corporation Street, Birmingham.

Blyth.—Houses (335); borough engineer.

Bournemouth.—Two blocks of flats, Surrey Road; Bournemouth Flat Construction Co.

Bradford.—Houses, Bertie Street and Gertrude Street; E. Dawson. Extensions to factory, Rook Lane; Textillis, Ltd.

Brighton.—Houses and flats (£48,200); borough surveyor.

Bristol.—Extensions to Southmead Hospital (£133,042); city engineer.

Bucknall (STAFFORDSHIRE).—Houses (50), near High Street, for S. Mason; Cotton, Son & Hulme, architects.

Bury St. Edmund's.—Factory, Fornham Road, for the Bury St. Edmund's Pure Ice Co., Ltd.; secretary.

Cannock.—Houses (40); R.D.C. surveyor.

Cardiganshire.—Girls' secondary school, Penglaise estate, Aberystwyth; director of education, Aberystwyth.

Carlisle.—Extensions to electricity distribution depôt (£25,114); James Millar & Sons, builders.

Cassop Colliery (Co. DURHAM).—Welfare institute; E. Graham, architect, Coal Trade Offices, Neville Hall, Newcastle-on-Tyne.

Cheltenham.—Houses (150), Whaddon Farm estate; borough engineer. Cinema, High Street; J. Owen Bond, architect. Cinema, Promenade; British Pictures Corporation, Ltd.

Cirencester.—Houses (50), Watermoor; S. J. Kear, builder, Coleford.

Colchester.—Senior school (£40,000); director of education.

Doncaster.—Extensions to Institution, Loversall, for the South West Yorkshire Joint Board for mental defectives; Vincent Turner, architect and surveyor to the Joint Board, Municipal Offices, Rotherham.

Dudley.—Omnibus station and market hall; F. H. Gibbons, borough engineer, Council House.

Eastbourne.—Extensions to Town Hall (£54,000); borough surveyor.

Friern Barnet (HERTFORDSHIRE).—Electricity showrooms and offices, for the North Metropolitan Electric Power Supply Co., Ltd., Northmet House, Cannon Hill, N.14.

Gloucestershire.—Grammar school, Chipping Sodbury; county architect.

Grayshott (SURREY).—Houses (40), for the Grayshott Housing Association; Herbert Collins & Birkett, architects, Southampton.

Great Yarmouth.—Nurses' home, Alexandra Road; Yarmouth Hospital Committee. Showrooms, Southtown Road; Jewson & Son, Ltd.

Hanley.—Houses (73), Birches Green Road, for Mr. Jackson; A. P. Lovall, architect. Theatre, Trinity Street (£55,000), for the Odeon Theatres, Ltd.; Harry W. Weedon, architect, Birmingham.

Haverfordwest.—Nurses' hostel for the Pembrokeshire County War Memorial Hospital; D. F. Ingleton, architect, 12, Victoria Place.

Hereford.—Cinema, shops and café, Commercial Road; Kemp & Tasker, architects.

Highworth (WILTSHIRE).—Houses (50); R.D.C. surveyor.

Horsham.—Houses (36); R.D.C. surveyor.

Irish Free State.—(DUBLIN).—College of domestic science and women's work, Cathal Brugha and Marlborough Street, for the City of Dublin Vocational E.C. of the Technical Institute, Bolton Street; Robinson & Keeffe, architects, 8, Merrion Square.

Kingston-upon-Thames.—Flats (£6,476); Messrs. Thorogood, 55, Bond Road, Tolworth.

Lancashire.—Grammar school, Darwen (£41,765); W. Livesey & Sons, Ltd., builders, Blackburn.

Leatherhead.—Cinema, Church Street; Leatherhead Property Trust.

Leeds.—Industrial buildings, Gelderd Road and Brown Lane, for Walmsley & Mandale; Braithwaite & Jackman, architects. Library, Sheepscar; J. T. Wright & Sons, Ltd. Extensions to Meanwood colony; H. A. Sandford, heating consultant.

Leicestershire.—Junior school, Hugglescote, for County E.C.

Liverpool.—Police wireless station, Reservoir Road, Woolton; Corporation Watch Committee. Girls' secondary school, Childwall Valley Road, and Council schools, Priory Road, Dingle Vale, Score Lane and Southbank Road, for E.C. Extensions to works, Dryden Road, for William Crawford & Sons, Ltd., Fairfield Biscuit works; John Williams (Liverpool), Ltd., builders, 70, Collingwood Street.

London.—(FOREST HILL).—Extension to factory for Sherborne & Co., Ltd., Kinslor Works, Honor Oak Park, S.E.23. (ST. MARYLEBONE).—Showrooms and offices, Oxford Mansions, Market Place; Robert Angell & Curtis, 133, Regent Street, W.1.

Longton (STAFFORDSHIRE).—Cinema, for Associated British Cinemas, Ltd.; John Maxwell, managing director.

Marshfield (NEAR CARDIFF).—Installation of electric lighting in Parish Church; Rev. H. G. Stanley, vicar.

Meir (STAFFORDSHIRE).—Houses (380), near golf course; F. Gibson. Houses (62), Sandon Road, for G. & J. Seddon, Ltd.; A. Glyn Sherwin, architect.

Middlesbrough.—Alterations and additions to premises, Linthorpe Road, for Wintersladen & Co.; T. Crawford, architect, 82, Borough Road. Extensions to the Central library and branch libraries, Grove Hill and Acklam; C. Gorman, borough engineer.

Newcastle-on-Tyne.—Hotel, Clayton Road, for F. Gordon; T. Clements & Son, builders, Selbourne Gardens. Extensions to the Diocesan home, Park Road; F. M. Dryden, architect, 6, Market Street. Improvements to public market (£73,450); R. G. Roberts, city architect, 18, Cloth Market.

Newcastle-under-Lyme.—Elementary school; A. Cotton, borough surveyor, Town Hall.

Northamptonshire.—Grammar school, Daventry; director of education, Northampton.

Paignton.—Houses (97), Ailescombe Road; Eastley & Co.

Paisley.—Extensions to works, for George Dobie & Sons, Ltd.

Pelaw-on-Tyne.—Extensions to the Co-operative Wholesale Society factories for the C.W.S. (Newcastle-on-Tyne Division).

Pontefract.—Hospital (£20,000); E. Stanley Hall, architect, 54, Bedford Square, London, W.C.1.

Rotherham.—Steel factory for B. Bennett, Junior, Ltd., Whiston Grange.

Rottingdean.—Extensions to Tudor Close Hotel, Dean Court Road; Rottingdean Hotel Co., Ltd.

Sale (CHESHIRE).—Houses (28); M. E. Bleakley, borough surveyor.

Sheffield.—Cinema, Eastern Avenue, Arbourthorne estate, for the Sheffield and District Cinematograph Theatres, Ltd.; Fowler & Marshall, architects, 3, Hartshead.

Somerset.—Nurses' home, Wells Mental Hospital (£20,350), for C.C.; county architect, Taunton.

South Shields.—Extensive improvement scheme at Harton Institution (£24,992); J. Reid, borough engineer.

Spalding.—Houses (78); R.D.C. surveyor. Cinema, Haverfield estate, electrical work, for the Odeon Theatres, Ltd.; Harry W. Weedon, architect, Birmingham.

Stockport.—Ritz theatre, Duke Street, for the Union Cinema Theatre Co., Ltd.

Stoke-on-Trent.—Houses (20), near Stone Road; W. Ball. Houses (134), Whieldon Road and Regent Road, Fenton; A. Bates, builder, Willowdale, Blythe Bridge. Extensions to Salopiam works, Victoria Road; Morley, Fox & Co., Ltd.

Stornoway.—Houses (70); Hugh Macdonald, architect, Thurso.

Sunderland.—R.C. school, Millfield; J. Cummings, builder, Matamba Terrace.

Sutton Coldfield.—Block of shops, High Street; Slater, Dunn & Co., 71, Temple Row, Birmingham.

Tenterden.—Houses (52); P. G. Banfield, clerk to the R.D.C., 5, East Hill.

Tunstall.—Houses (1,494), Chell Heath; T. B. Cartlidge.

Walsall.—Houses (93), Council estate (£30,030); Sabin & Young, Ltd. Extensions to Manor Hospital (£31,328); borough engineer.

Warsop (NOTTINGHAMSHIRE).—Houses (32); U.D.C. surveyor.

West Riding.—Senior school, Darfield, for County E.C.

West Sussex.—Hospital, Chichester, including nurses' home, ward block and administration block, for C.C.; C. G. Stillman, county architect, Chichester.

Whitley Bay.—Houses and shops, Plessey Crescent, for Temple & Pyle, Ltd., builders, Whitley Road.

Wigan.—Extensions to Royal Albert Edward Infirmary for the Board of Management; Thomas Worthington & Sons, architects, 178, Oxford Road, Manchester.

Wolverhampton.—Nurses' home, Horsman Street, for the Board of Management, Queen Victoria Nursing Institution, Bath Road; Lavender & Twentyman, architects, Waterloo Chambers, Waterloo Road.

Wombwell (YORKSHIRE).—Houses (36); U.D.C. surveyor. Houses (28); G. W. Meanley & Sons, builders.

York.—Houses (110); W. J. Simms, Sons & Cooke, Ltd., builders. Houses (156), and flats, Water Lane estate; Tarran Industries, Ltd., builders, Hull. Municipal buildings; city surveyor.